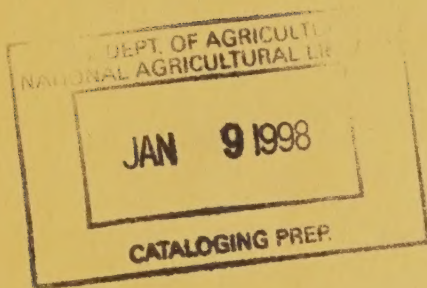


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Russell *Agg*

ECONOMIC ASPECTS OF SOVIET AGRICULTURE

REPORT OF A
TECHNICAL
STUDY GROUP

Agricultural Research Service

UNITED STATES DEPARTMENT OF AGRICULTURE

FOREWORD

An Agreement, concluded on January 27, 1958, between the Governments of the United States of America and the Union of Soviet Socialist Republics, provides for exchanges in the cultural, technical, and educational fields during 1958 and 1959. This Agreement is regarded as a significant first step in the improvement of mutual understanding between the peoples of the two countries.

Agriculture, which plays an important role in the national economies of the two countries, was specifically included in the Agreement as a field for exchange of specialist. The U. S. Department of Agriculture accordingly sent to the Soviet Union in 1958 six technical study groups of specialists in the following subjects: Agricultural Economics; Agricultural Crops; Soil and Water Use; Veterinary Science; Mechanization of Agriculture; and Cotton Growing and Plant Physiology. In 1959 it is planned to send three additional study groups in the following fields: Forestry, Lumbering, and Millwork; Sheep Raising; and Biological Control of Agricultural Pests.

The Soviet Union in turn sent to the United States in 1958 six delegations of specialists in the following subjects: Farm Mechanization; Hydro-Engineering (Irrigation) and Reclamation; Animal Husbandry; Cotton Growing; Agricultural Construction and Electrification; and Veterinary Science. In 1959 three additional Soviet teams are expected in the following fields: Mixed Feeds; Forestry, Lumbering and Millwork; and Horticulture.

Each United States exchange study group, on completion of its assignment, prepared a report for publication. Economic Aspects of Soviet Agriculture represents the report of the Agricultural Economists exchange group and was prepared by: Sherman E. Johnson, Chairman, Agricultural Research Service; Harold F. Breimyer, Agricultural Marketing Service; Carl P. Heisig, Agricultural Research Service; John W. Kirkbride, Agricultural Marketing Service; and Lazar Volin, Foreign Agricultural Service. The photographs were taken by Harold E. Wingo, Office of Information, who accompanied the Agricultural Economists delegation.

Gustave Burmeister
Assistant Administrator
Agricultural Trade Policy and Analysis
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KEY TO MAP

Areas

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|-------------------------|---------------------------|-----------------------|---------------------------------|
| 1. Northern | 7. Central non-black soil | 13. Georgia S.S.R. | 19. Eastern Siberia (not shown) |
| 2. Northwestern | 8. Central Black soil | 14. Azerbaijan S.S.R. | 20. Far Eastern (not shown) |
| 3. White Russian S.S.R. | 9. Volga | 15. Armenian S.S.R. | 21. Kirgiz S.S.R. |
| 4. Lithuania | 10. Ukrainian S.S.R. | 16. Ural | 22. Uzbek S.S.R. |
| 5. Latvia | 11. Moldavian S.S.R. | 17. Western Siberia | 23. Tadzhik S.S.R. |
| 6. Estonia | 12. Northern Caucasus | 18. Kazakh S.S.R. | 24. Turkmen S.S.R. |

Cities

- | | |
|---------------------------------|---------------------|
| 1. Leningrad | 6. Tashkent (Uzbek) |
| 2. Moscow | 7. Alma-Ata |
| 3. Kiev | 8. Akmolinsk |
| 4. Simferopol, Crimea Peninsula | 9. Novosibirsk |
| 5. Krasnodar | 10. Krasnoyarsk |

Rivers

1. Volga
2. Yenisey
3. Dnieper

ECONOMIC ASPECTS OF SOVIET AGRICULTURE

Report of a Technical Study Group

INTRODUCTION

The agricultural economist technical study group arrived in Moscow the evening of July 4, 1958. When we left there on August 4, we had traveled about 12,000 miles within the Soviet Union, visiting farms, research stations, and other agricultural enterprises in 10 major farming regions. We obtained much specific information on agriculture in the areas visited as well as for the nation as a whole. But there are many gaps in our information on Soviet agriculture. The vastness of the country, shortness of the stay of the group, and lack of overall statistics on many segments of agriculture, together with the normal difficulty encountered by visiting specialists in such a situation, made it difficult to appraise the present and prospective agricultural conditions in the Soviet Union in more than an approximate sense.

As information in the United States about the agricultural potentialities of the Soviet Union is far from adequate, we have attempted to piece together our findings with other available data to arrive at general though tentative conclusions. We hope that this report will contribute to a better understanding of the present situation in the Soviet Union and of the changes that are taking place there; and that it will stimulate more detailed appraisals of Soviet agriculture in the future.

No adequate appraisal of the agricultural situation in the Soviet Union or anywhere else can be made without reliable agricultural statistics. Many of the statistical series that are basic to an understanding of Soviet agriculture have not been available. However, a considerable improvement has taken place during the last few years. Fortunately, the publication of annual statistical yearbooks and of compilations of statistics dealing with special subjects was resumed in 1957, but there are still many gaps in statistics relating to agriculture.

Detailed data on sown acreage, by crops, and of numbers of different kinds of livestock have been published for recent years. The annual livestock census was shifted

back to January in 1958, after a change to October during the preceding 4 years. Since January estimates were also provided for those years, it is possible again to trace developments in the livestock industry over a period of years.

A great deal of information also has been provided on the different kinds of farms and their equipment, such as tractors and combines. But the data on the farm labor force and on income, expenses, and their distribution are inadequate. The published statistics on land utilization also are incomplete. The most serious gap is in the information on production and utilization of crops, especially of the important grain crops. It is understood that the so-called biological, preharvest method of estimating yields, which greatly overestimated production of crops, was abandoned in 1953, and that the Soviet authorities are operating now with actual harvest or barn yields as a final estimate. Except for some fragmentary data for nongrain crops, only indices related to an unstated base were published until recently for yields and production of crops, and not actual figures.

Production and utilization data are regularly available for the United States and for nearly every other country. In the past they were also available for the Soviet Union and for prerevolutionary Russia. The agricultural economics exchange group inquired about the availability of national production statistics, and were informed that for such important crops as grains they constitute classified information.¹ On the farm visits, however, there was no hesitation in revealing production statistics on a local basis.

Unlike crop production, data were reported in recent years for government procurements of the more important agricultural products. Such procurements are highly important because they provide the bulk of the supplies for consumption by

¹After this report was prepared for publication, the Soviet Government disclosed, for the first time, estimates of total grain production in recent years, as well as the figures of the 1958 production of wheat, corn, and of several nongrain crops.

the urban population and by the rural population of deficit farm regions, as well as for stockpiling and for exports. Yet even procurement figures for grain are not broken down for individual crops, such as wheat or rye.² As far as utilization of farm products is concerned, only annual figures of quantities and values of exports and imports for 1955-57 are available. As for data on domestic consumption of food, again only indices related to an unstated base have been published. These are obtained by annual sample surveys of household budgets.

We have attempted to bridge the statistical gaps on some phases of agriculture by drawing on local data and on personal observations. The possibility of a wide margin of error in estimates arrived at in this way must be recognized. There is also the possibility of error in available statistical data. We are confident, however, that the evidence substantiates the directions of the changes that are outlined in this report.

The central agricultural problem in the Soviet Union in recent years has been that of expanding production of food and fiber. Large increases were necessary from the low postwar levels to meet the require-

ments of the growing population and to provide supplies for Soviet stockpiling and export programs. This objective was vividly impressed on the 1958 technical exchange group in agricultural economics in discussions with Soviet officials and technicians, and by the displays on the farms that were visited. Numerous posters were displayed on the farms and on the roadsides, with slogans exhorting the farmworkers toward expanded production.

The fact that the population of the Soviet Union is not only growing rapidly at present, but also is becoming increasingly urbanized with the industrial development of the country, as indicated in table 1, accentuates the need for greater farm output. For urbanization not only decreases the manpower on farms, but it normally brings with it a desire for higher quality diets. These diets require increased supplies of animal and dairy products, sugar, vegetables, and fruits. Political and psychological factors also have made more urgent the long promised improvement of living levels.

The agricultural problem in the Soviet Union, therefore, is diametrically opposite that in the United States, where reduction of farm surpluses, resulting largely from wartime expansion, rapid technological progress, and high production per man and per acre has been a major task of

²After this report was prepared for publication, figures of government wheat procurements for 1958 and 1953 were officially announced.

TABLE 1.--Population of the Soviet Union, total, rural, and urban, selected years¹

Year	Total population	Rural		Urban	
		Number	Percentage of total	Number	Percentage of total
	<i>Million</i>	<i>Million</i>	<i>Percent</i>	<i>Million</i>	<i>Percent</i>
1926 ²	147.0	120.7	82.1	26.3	17.9
1939 ³	170.6	114.5	67.1	56.1	32.9
1956 ⁴	200.2	113.2	56.6	87.0	43.4

¹ Source: P. 19 of--U.S.S.R. Council of Ministers Central Statistical Board. Forty Years of Soviet power in facts and figures. 319 pp., illus. Moscow. 1958. [In English; translated by Foreign Languages Publ. House, Moscow.]

² Census of December 17 for prewar territory.

³ Census of January 17 for prewar territory.

⁴ Estimate in April for the present territory.



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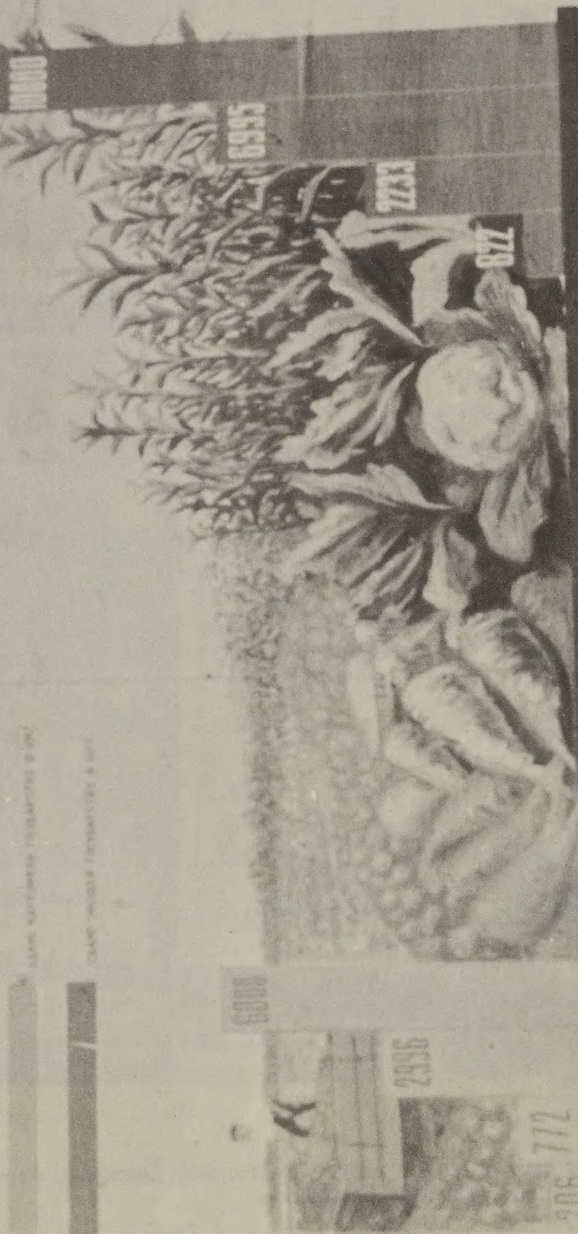
This poster sets the production goals that the workers must reach on a collective farm near Leningrad, if they are to participate in the All Union Agricultural Exhibition,

public policy. By contrast, in the Soviet Union a battle for bigger crops and more livestock products is the story of agriculture today.

The agricultural production capacity of a country depends on the interaction of nature and man--an interaction of land and resources as characterized by soil and climate and with economic and social factors, such as the institutional structure

of agriculture, the labor supply and its motivation, the capital equipment, the status of its technology, farm practices, and farm management. Since it is with this second set of factors that our exchange group was primarily concerned in its investigation, we will touch briefly on the natural environment and only to the extent that it is necessary to round out the picture of Soviet agriculture.

РАСТЕНИЕВОДЫ СОВХОЗА! ВЫРАСТИМ В 1958 ГОДУ ВЫСОКИЙ
УРОЖАЙ ВСЕХ СЕЛЬХОЗКУЛЬТУР! ОБЕСПЕЧИМ ПТИЦЕВОДСТВО
И ЖИВОТНОВОДСТВО ВИТАМИННЫМИ СОЧНЫМИ И ГРУБЫМИ
КОРМАМИ!



1953 1956 1957 1958

1953 1956 1957 1958

This sign on a State farm near Leningrad is typical of incentive advertising.

LAND, CLIMATE, AND SOILS

Although the Soviet Union is one of the leading agricultural countries of the world, with a huge sown area of more than 480 million acres, much of the country is not suitable for farming. The total area of 8,600,000 square miles is nearly 3 times as large as continental United States, but agriculture is confined largely to a heartland represented by a so-called "fertile triangle." The base of this triangle stretches, roughly, from Leningrad on the Baltic Sea in the north, along the western frontier to the Black Sea in the south, and the apex is located at Krasnoyarsk on the River Enisey in central Siberia. To the north is the forest zone and beyond are the tundra wastes; along the southern and eastern borders are high mountain chains; and in the southeastern parts are large deserts. Thus, much of the vast area, with some local exceptions, is unsuited or ill-adapted to farming. The dry areas near well-watered mountain areas can be irrigated.

But even in the fertile triangle itself, there are serious limitations on agriculture. Much of it is characterized by

. . . a cool continental semiarid climate similar to that of the spring wheat region of the Prairie Provinces of Canada and the Dakotas of the United States. . . . The western part of the Fertile Triangle is less continental than interior North America; it has slightly milder winter conditions and a longer growing season than American areas with similar summer temperatures.³

Climate

The geographical location of the Soviet Union helps to explain the severity of its climate. How far north the country is located can be best visualized when it is pointed out that Yalta, at the southern tip of the Crimea, is approximately in the same latitude as Rochester, Minn.; and Odessa, on the Black Sea, is in the same latitude as Duluth, Minn. Furthermore,

The great longitudinal extent of the Soviet Union results in extreme continentality. Much of the Soviet Union is thousands of miles from any body of water that might ameliorate the climate or provide a source of moisture. The Arctic Ocean,

covered by ice during most of the year, plays no significant mitigating role.⁴

Both temperature and moisture are adversely affected by the continentality of the Russian climate. The average growing season, indicated roughly by the frost-free period, is short, even in central and southern Russia. In Moscow, the average frost-free season is about 130 days, corresponding to that of central North Dakota. It is necessary to go as far south as Krasnodar in the Kuban's⁵ region of northern Caucasus to find an average of 190 frost-free days or about the same as in east-central Kansas. The average frost-free season decreases toward the east and is very short in Siberia and Kazakhstan, where a new vast program of expansion of the crop acreage is under way. The frost-free season is 129 days in Akmolinsk, 122 in Novosibirsk, and 120 in Krasnoyarsk. Another unfavorable feature is the year-to-year variability of the frost-free period, with the danger of late spring and early autumn frosts, especially in the more northern and eastern regions.

The short growing season and the severe prolonged winter over much of the agricultural area limit the choice of crops and their varieties and, thus, affect unfavorably yields per acre. A case in point is winter (fall-sown) grain, particularly wheat, which cannot be successfully grown in many areas. Yields per acre of winter grains are usually higher than those of spring varieties. Fruit trees are frequently endangered by killing frosts. A short growing season also necessitates concentration of farm operations within a brief period, thereby increasing the seasonal load. However, the temperature deficiency in the more northern regions of the Soviet Union is to some extent compensated for by longer daylight during the growing season. This factor, together with the use of plant varieties and farm practices especially adapted to the climate and topography, explains the extension of agriculture so far north.

Not only is agriculture in the Soviet Union handicapped by the rigorous and protracted winter and the resulting short cultural season, but it is also hampered by deficiency of moisture over considerable

⁴Harris, op. cit., p. 260.

³Harris, Chauncy D., *Soviet Agricultural Resources Reappraised*, Jour. Farm Econ., 38: pp. 262, 264, 1956.

⁵This is the area immediately north of Caucasus Range near the Black Sea, known officially as the Krasnodar Province.

areas. Annual precipitation in the central and western parts of the country is 20 to 25 inches. It decreases southward and eastward and is lowest in the dry and desert steppes that extend from the lower Volga basin east and south into Central Asia. The highest precipitation is found in the subtropical region on the Caucasus coast of the Black Sea.

The precipitation in the northern European part of the country, accompanied by low temperature and consequent slight evaporation, is normally sufficient for the crops that are grown there. In fact, that region, with its abundant marshy lands and numerous lakes, suffers more often from an excess than from a deficiency of moisture. In the south and east, light rainfall is accompanied by high summer temperatures and high evaporation. Here moisture is the limiting factor in crop production.

Not only is the annual precipitation light in most of the southern and eastern agricultural regions of the Soviet Union (less than 16 inches), but its distribution is irregular from year to year. During the growing season rainfall is often inadequate for crops, particularly the early spring cereals such as wheat.

Late spring and early summer droughts frequently occur and they are especially disastrous when preceded by a dry autumn and a winter with little or no snow. Droughts are often aggravated by scorching dry winds, the so-called sukhovei that play havoc with the crops. The southeastern European part of the U.S.S.R. (exclusive of the Kuban' or Krasnodar regions of northern Caucasus) and a large part of the adjacent Kazakhstan and southern Ural are especially vulnerable to recurrent droughts. East and south of this semiarid zone, toward and beyond the Caspian Sea, is the desert where only irrigated agriculture is practicable.

The subhumid and semiarid zones include many of the most fertile areas of the country. In these zones, most of the expansion in crop acreage has taken place since the latter part of the nineteenth century, including the recent program of bringing under cultivation large tracts of virgin land. So far, irrigation has not played a significant role in the subhumid and semiarid zones, but it is important on the desert lands of central Asia, where most of the Soviet cotton is grown. Irrigation may become important, however, in the basins of the Volga, Don, and Dnieper Rivers.

The Soviet semiarid zone has its counterpart in the United States. But one cannot compare figures for rainfall alone. Because of its northern latitude and lower evaporation, 10 to 15 inches of precipitation in the Soviet zone are more effective than a like amount in the central and southern Great Plains of the United States.

Then, too, the production attained in a given area is a result of the interaction between the climate and the soil. Generally, a higher proportion of the rain falls as gentle rain in the Soviet Union than in our Great Plains. Many of the Soviet soils are gently undulating to nearly level deep loess. They are permeable, and a high proportion of the precipitation goes into the soils.

Nevertheless, the crucial disadvantage of the continental Russian climate is the inverse relationship in the distribution of heat and moisture, both of which are essential for plant life. As the amount of heat increases, from north to south and west to east, moisture tends to diminish and the maximum of heat is accompanied by a minimum of moisture. A more advantageous combination of climatic elements occurs only in the subtropical region of the eastern (Caucasus) coast of the Black Sea, with its high moisture and temperature, and in parts of central Ukraine and in the Kuban' region of northern Caucasus.

Soil Resources

Soil resources in the Soviet Union are more favorable to agriculture than the climate. The huge area of the Soviet Union has a lesser diversity of soils than the United States. The different soils are distributed in rather well-defined geographical zones or belts. From an agricultural standpoint, the most important group of soils has been that of the fertile black soils, or Chernozem, and its close relatives. They are characteristic of the steppes and wooded steppes of the central and southern European part of the USSR, and they extend in a narrow belt into southwestern Siberia and northern Kazakhstan. These soils occupy less than 10 percent of the total area of the country, but they comprise a large part of the crop acreage and have been the natural foundation on which Russian agriculture has developed. The next drier zone has dark Chestnut soils, comparable to the Reddish Chestnut soils of the central part of North Dakota extending farther north into Canada. In still drier areas are the light Chestnut

soils, comparable to the Brown soils of the United States, which are marginal for small-grain production without irrigation in both continents.

The late C. F. Marbut, a distinguished soil scientist of the United States Department of Agriculture, who visited the Soviet Union in the early thirties, estimated that the Soviet Union had over 480 million acres of Chernozem first-grade land (all land, not merely tillable land) and over 370 million acres of Chestnut soils and inferior Chernozem as against less than 100 million and 135 million acres respectively, in the United States.⁶

To the north of the Chernozem (black) soils belt are Gray Podzolic and marshy peat soils, which occupy more than a third of the total area of the country. Though the Gray Podzolic soils are much less fertile than the Chernozem soils, yet their agricultural significance should not be minimized. With proper use of fertilizer and with liming and drainage of sections having excessive moisture, a considerable part of the area, especially the western

part that has relatively milder climate, is fit for agricultural production, particularly the growing of rye, flax, fiber, potatoes, various root crops, and hay. Dairy farming is well adapted to parts of this area.

In White Russian (Belorussia) S.S.R. especially large areas of excellent organic soils are only partially developed. Large reclamation and drainage schemes are under way in this region. However, frequent cool and wet conditions during the crop season may be nearly as hazardous for crops other than forage on the Gray Podzolic and peaty soils as the drought hazard is for the crops on the Chernozem and Chestnut soils.

Thus the Soviet farmer has to wage a stiffer battle against nature, particularly the cold climate, than the American farmer. For Russia has nothing corresponding to three of the most productive regions of the United States--the Mid-Latitude Region, the Corn Belt, and the Cotton Belt, all of which have been of tremendous importance in the production of the agricultural wealth of the United States.⁷

LAND UTILIZATION

The most recent data on land utilization on a national scale are for 1939 and, therefore, pertain to the prewar territory of the Soviet Union (table 2).

The data are incomplete for the postwar territory. Such fragmentary figures as are available, however, do not indicate any significant change from prewar in the proportion of the total area in different major uses.

Land classified as plowland or tillable land, with which orchards and kitchen gardens may be combined, is the most important category from an agricultural standpoint. It includes the area actually seeded to crops and also the first reserve of potential cropland; that is, land that can be easily converted to such use. This potential area consists of (1) idle land, some of which was cultivated at one time and later abandoned; and (2) of a considerable area of summer (plowed) fallow designed to increase the moisture supply, to control weeds, and to make the soil nutrients more readily available. Some of the summer fallow acreage in the northwestern and north-central European areas

of the country appears to be a survival of the old three-field system. Plans are under way to use these lands for crop production.

The total plowland, including orchards and gardens, reached a huge area of over 546 million acres in 1939; yet this acreage was less than 11 percent of the vast area of the country. By 1955, plowland reached 576 million acres, but this constituted about the same proportion of the present enlarged total area.

The next category is that of the permanent meadows and pasture, accounting for 16 percent of the total area. A part of this vast acreage can be converted to cropland. It was an important source of the recent increase in sown area of more than 90 million acres, largely in the eastern part of the Soviet Union.

These "new land" areas are located predominantly in the subhumid and semi-arid zones beyond the Volga River and the Ural Mountains. As was pointed out in a previous section, climatic conditions in these areas are likely to result in fluctuating

⁶Marbut, C. F. Russia and the United States in the World's Wheat Market, *Geog. Rev.* 21: 1-21, illus. 1931.

⁷Marbut, C. F. Agriculture in the United States and Russia. A comparative Study of Natural Conditions, *Geog. Rev.* 21: 612. 1931.

TABLE 2.--Land utilization in the Soviet Union, 1939¹

Uses of land	Million acres	Percent of total
Orchards and kitchen gardens.....	39.5	0.8
Plowland.....	² 506.6	9.8
Of which sown acreage.....	333.6	
Permanent pastures and meadows.....	835.2	16.2
Forests and brushland.....	1,976.8	38.3
Land unusable for agricultural purposes.....	1,801.3	34.9
Total.....	5,159.4	100.0

¹ Source: D. G. Vilenski, ed., *Akademiia Nauk, SSSR. Estestvennoistoricheskoe Raionirovaniie* SSSR, p. 309. Moscow, Leningrad, 1957.

² Plowland in the present territory reported as 576 million acres on November 1, 1956. *Narodnoe Khoziasstvo SSSR v 1956 Godu*, p. 109.

tuating crop yields and, therefore, a low average outturn, even on the fertile Chernozem and Chestnut soils. This is true of most of the potential additions to the cultivated area. The available acreage is mostly in regions that are adversely affected either by aridity or short growing season, or both.

In regions of established agriculture with favorable climatic conditions and fertile soils, such as parts of the Ukraine and northern Caucasus, pasture and natural meadowland have been seriously diminished by the encroachment of plowland. In such regions, therefore, a substantial increase of the cultivated area at the expense of pasture and meadows is unlikely.

Forests and brushland accounted for 38 percent of the total area, and agriculturally unusable or unsuitable land accounted for 35 percent in 1939. Thus, more than 70 percent of the total area of the Soviet Union is nonagricultural as compared with an estimated 42 percent for continental United States. Some additional forest and brushland area may be cleared and used for cultivation, but such land is located in the more northern regions that have short growing seasons, and much of the soil will require heavy application of fertilizer and lime to make it productive.

In the western and north-central European areas of U.S.S.R., a considerable acreage of marshland and swamps can be reclaimed and turned to productive use,

as meadows, pasture, and cropland. Indications are, however, that reclamation operations are proceeding slowly, and sometimes with a subsequent considerable gap in the utilization of the reclaimed land.⁸

Soviet authorities state that a large part of the present agricultural area in these humid regions also needs drainage, the installation of which is naturally a slow process. Installation is especially slow for closed drainage, owing to a shortage of pipe, according to a statement made to our technical exchange group.

On January 1, 1956, the area having installed drainage was reported at 20,052,000 acres, as compared with 150 million acres in the United States. American soils specialists, who in the summer of 1958 visited some of the agricultural regions of the Soviet Union in which extensive drainage is required, observed that reclamation through drainage is being expanded in the Soviet Union. For instance, the 7-year plan includes drainage of some 1.4 million acres in the Ukraine. Other drainage is planned throughout the northern areas suitable for farming. Much of this involves only local projects.

"Plans are being developed to drain and reclaim 1½ million hectares (3,700,000 acres) of excellent peat soils north of

⁸ *Sel'skoe Khozyaistvo* [a newspaper of the Ministry of Agriculture of the USSR] July 4, 1958, and *Kommunist Estoni*, No. 2, 1958.

Minsk. This work will be done by the government and the land will be allotted mostly to state farms. On state and collective farms with marshlands and waterlogged soils, the engineering design of the drainage systems is done by the government. The government also builds all trunk and main outlet drains. Drains on the collective farms and tile systems are financed 50 percent by the government and 50 percent by the collective farms. The average cost of reclaiming marshlands is about 4,400 to 5,000 rubles per hectare. The cost runs even higher if extensive clearing of brush and land leveling are required."⁹

Although the Soviet Union has a large irrigated area, reported at more than 27 million acres at the end of 1955, it constitutes less than 5 percent of the total plowland. It is somewhat smaller than the irrigated area of the United States, which was 29,552,000 acres at the end of 1954, according to census reports, and was estimated at about 32,500,000 acres in 1957. In the United States, the irrigated area is concentrated in the western part of the country, whereas in the Soviet Union it is concentrated mainly in the central Asiatic and the trans-Caucasian republics. The 5.3 million acre cotton crop is grown entirely under irrigation, and accounts for close to one-fifth of the total irrigated acreage. The agricultural economics research group was told that plans were under way to irrigate 2 to 2.5 million acres of additional land in the cotton areas by 1965. About half of this land would be planted to cotton.

The Stalin regime established a program to irrigate 15 million acres in the southeastern and southern European U.S.S.R. to grow wheat, cotton, and other crops. This program has been abandoned by the post-Stalin administration.

The official Economic Plan for 1956-60 (abandoned in 1957 in favor of a new 1959-65 Plan) had a more modest goal. The plan specified construction of a new irrigation network on an area of 3.2 million acres and reconstruction of the old network on an area of close to 2 million acres. This acreage was to be used principally for growing cotton and other intensive crops. Thus, instead of continuing with large irrigation projects, which are costly but would have raised crop yields materially, the

Soviet Government followed, during the years 1954-56, the traditional path of acreage expansion in the subhumid and semiarid zones where rather low and unstable yields can be expected.

In southern Ukraine the group was told that the irrigated acreage is to increase from around 500,000 to 1,250,000 acres, as a result of the Kakhovka hydroelectric power project. Most of the area is to be used for sugar beets instead of cotton, as was originally planned.

No figures are available as yet on the planned extension of the irrigated area during the 1959-65 period, but in the "Theses" of Prime Minister N. S. Khrushchev on the subject, published in *Pravda* and *Izvestiya*, November 14, 1958, it was stated that "It is planned to continue the work of expansion of irrigated area in cotton-growing regions . . ."

It is possible, however, that irrigation also will be expanded in some other areas, particularly in the southeastern European part of the country. Nevertheless, it would appear that the irrigated sector will continue for sometime to play a relatively limited role in Soviet agriculture, except in the cotton areas. But the potentialities for a sizable expansion of the irrigated area, should the government decide to embark on such a course and make the necessary investment, must not be overlooked.

To sum up, agriculture in the Soviet Union, as in the United States, has not reached the physical frontier of cultivation. Moreover, such a frontier may itself recede in the future because of scientific and technological progress. Doubtless, a considerable area of marginal land, even apart from costly irrigation and drainage, could be pressed into cultivation. The economic cost criteria that normally inhibit the arable use of such land in other countries are much less effectively operative in the Soviet economy. The sown area may also increase at the expense of summer fallow now practiced in the humid regions as a survival of the three-field system of crop rotation. But such an increase, as well as that derived from new land additions may be largely offset by withdrawal of cultivated acreage for increased summer fallow in the semiarid regions. For instance, after a rapid expansion during 1954-56, the sown area did not change much in 1957 and 1958, as shown below. It is also symptomatic that recent Soviet official pronouncements, including oral statements to the exchange group, and the above-men-

⁹ U. S. Soil Conservation Service, Soil and Water Use in the Soviet Union, Report of a Technical Study Group, U. S. Dept. Agr., Soil Conservation Service, Unnumb. Pub., 52 pp. 1959.

tioned Khrushchev's "Theses" for 1959-65, uniformly stress the improvement of crop yields as the road to increased production and not large expansion of crop acreage.

Year	Area sown ¹ <i>Million acres</i>
1940 ²	371.6
1945 ²	281.2
1950.....	361.5
1951.....	378.1
1952.....	384.9
1953.....	388.4
1954.....	410.5

Year	Area sown ¹ <i>Million acres</i>
1955.....	459.1
1956.....	481.1
1957.....	478.6
1958.....	483.1

¹Data from official sources. Area for harvest exclusive of winterkilled grain not resown in the spring.

²Figures for territory within the boundaries of that year and are not fully comparable with those of later years.

ORGANIZATION OF FARMING

An American agriculturalist, accustomed to the predominance of family farms in the United States, cannot help but be startled by the large size of the farm units in the Soviet Union. In the United States, farms are increasing in size and in capital equipment, to be sure, but most of them are still operated by single families with little additional hired labor. The farms in the Soviet Union are huge, both in terms of the land area and of the labor force used. Furthermore, all land is nationalized and agriculture has been collectivized, with the exception of small household allotments. Operations are closely controlled by the government.

There are two kinds of farms in the Soviet Union. First in number and in agricultural area are collective farms proper, known as *artel*, or more commonly *kolkhoz*, (plural, *kolkhozy*). Second are the state farms or *sovkhoz* (plural, *sovkhozy*).

On January 1, 1958, there were 76,500 collective farms and 5,900 state farms in the Soviet Union, or a total of 82,400 farms. This compares with an estimated total of 4.8 million farms in the United States on the same date, of which about 2 million were full-time commercial farms. Thus, the Soviet Union with about one-third larger sown area than the United States has only 1.7 percent of the total number of farms and 4 percent of the full-time commercial farms. This gives some indication of the scale of operations on each farm; also the concentration of management decisions in a relatively small group.

Collective Farms

The collective farms were formed in the 1930's by obligatory consolidation of more than 20 million small peasant holdings.¹⁰ The latter were divided into numerous scattered (noncontiguous) strips and represented the predominant organization of farming after the liquidation of the large estates following the revolution. Now collective farming is the predominant type, accounting for close to 70 percent of the total sown area.

The peasants, who were for the most part forced into the new collectives or off the land, have continued to live in their rather primitive dwellings, grouped in farm villages, as they did before collectivization. Even the peasant families in the western regions who lived on separate farmsteads similar to those in the United States were eventually moved into the villages.

Peasant households as well as a number of other workers' families are allotted small plots of land on which they grow potatoes, vegetables, sunflower seeds, and other crops. They are also permitted to own a small number of livestock and an unlimited number of poultry. But members of the household must work on collective farms or on state enterprises in order to be entitled to the household allotments.

This is now the only remnant of independent private farming in the Soviet Union. It accounted for only 3 percent of the sown

¹⁰ In the annexed western regions, a similar process of collectivization took place after World War II.



These thatched-roofed peasant homes on a collective farm in the southern Ukraine show the allotted plots behind the houses.

area in 1956, but for a much larger proportion of the livestock population, including almost half of all the cows. Such small-scale but highly intensive farming has played an important role in the peasant's income and in national food supply, but the role has diminished in recent years. There is a disposition on the part of the government to regard the household allotment farming as transitory, and Soviet policy toward it has varied.

The peasants on collective farms (called *kolkhozniki*), both men and women, work in the fields and livestock centers under the direction of managers and supervisors, just as workers do in the Soviet factories. They are not paid regular wages. Instead, they are the residual sharers in the income of collectives. The claims of the state and the capital outlays and current production expenditures are met first. Some funds also

are set aside for pensions and for cultural activities. Earnings of individual workers on a collective farm vary with their skills and with the amount of work performed. The work performed is evaluated in so-called workday units, which are really arbitrary units set up to record the performance of certain standard daily tasks or operations and to provide a basis for distribution of the residual income in cash and in farm produce. The greater is the skill required, the larger is the number of workday units allowed for satisfactory performance of a standard task or operation and by the same token the greater is the earnings of a collective farm member. Likewise, the greater is a worker's accomplishment on a given task, the greater is his earnings.

A move has been initiated by the government in recent years to schedule the pay-

ments to the workers in collectives more evenly throughout the year by means of cash advances. Previously, the common practice was to pay at the end of the year. Experiments also are under way on some collective farms to pay entirely in cash rather than in both farm produce and cash, and to abandon the cumbersome workday-unit system. (See later discussion of farm income.)

Theoretically, the management of collectives (the chairman and the executive board) is supposed to be elected by the membership. We gained the impression, however, that management has been selected and changed at will by government officials. This tendency probably has become accentuated with the increase in the size of collectives. The increase in size occurred as a result of a deliberate process of

merger of collectives that reduced their number from more than 250,000 at the beginning of 1950 to 76,500 on January 1, 1958.

In 1956, the average collective farm had 238 peasant households and a sown area of about 4,500 acres. In 1957, the average number of peasant households increased to 245, but the average sown area decreased to about 4,200 acres.

The average size of collective farms varies considerably, according to region, as shown in tables 3 and 4. Yet, the striking contrast with the size of farms in the United States remains. In 1954, the average acreage of all land per commercial farm in the United States, and not merely sown crop area, was 310 acres. Only 4 percent of commercial farms had 1,000 acres or more of land, and many of these farms were in dry land grain or range pasture areas.

TABLE 3.--Percentage distribution of collective farms by sown area, U.S.S.R. and selected regions, 1956¹

Sown area	All USSR	Northwestern	Northern Caucasus	Western Siberia
500 hectares (1,236 acres) and under.....	Percent 17.8	Percent 64.2	Percent 22.6	Percent 5.4
501 to 1,000 hectares (1,238 to 2,471 acres).....	24.7	25.9	6.7	5.8
1,001 to 2,000 hectares (2,473 to 4,942 acres).....	29.0	9.3	7.5	17.9
2,001 to 5,000 hectares (4,944 to 12,355 acres).....	22.5	.6	28.3	46.5
Over 5,000 hectares (12,355 acres).....	6.0	--	34.9	24.4
Total.....	100.0	100.0	100.0	100.0

¹ Source: *Narodnoe Khoziaistvo SSSR v 1956 Godu*, p. 143.

The huge size of collective farms has made it necessary to subdivide operations into more manageable units. The workers are organized into brigades, consisting of 40 to 60 workers, headed by a brigadier or a foreman. Each brigade is assigned to a unit of cropland or to a livestock center. Still smaller units, called *zveno* or squads are formed and these workers cultivate the more intensive crops, such as sugar beets and cotton.

The exchange group inquired about the availability of studies analyzing the relation between the size of the farm unit and its efficiency, with a view to determining the optimum size in different regions. We were told that such information was not available at the present time, although apparently some studies of this type are under way. We gained the impression that in striving for bigness, per se, farm efficiency was actually neglected. Even with brigade sub-

TABLE 4.--Percentage distribution of collective farms by number of households, U.S.S.R. and selected regions, 1956¹

Number of households	All USSR	Northwestern	Northern Caucasus	Western Siberia
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
100 and under.....	19.0	61.6	9.2	17.3
101 to 200.....	34.3	33.2	24.4	44.4
201 to 300.....	20.7	4.4	20.6	25.0
301 to 500.....	17.6	.7	18.9	12.3
Over 500.....	8.4	.1	26.9	1.0
Total.....	100.0	100.0	100.0	100.0

¹ Source: *Narodnoe Khoziaistvo SSSR v 1956 Godu*, p. 142.

divisions, much time is consumed in going to and from places of work. Although Soviet agricultural authorities stress increasing efficiencies associated with larger sizes of operations in discussing desirable sizes of farms, their thinking is in terms of very large units by U. S. standards. They did state, however, that some of their largest farms, up to 150,000 hectares (about 375,000 acres), are considered to be too large. The present sizes probably are influenced more by the greater ease of centralized management and control than by economies associated with size of operation. Large farms mean fewer units of contact for state direction of planning and operation; also fewer managers will be needed to translate the overall plans into specific operations.

A peculiar feature of the collective farm system in the Soviet Union until 1958 was that the collectives, with some exceptions, did not own and operate the tractors, combines, and other modern machinery that have played such an increasingly important role in Soviet agriculture. These implements were owned and operated by the state machine-tractor stations (or MTS), which serviced the collectives for stipulated fees paid in kind. The MTS thus became an important instrument for procurement of farm products by the Soviet Government. They also became focal points of state supervision of collective farming on a local level.

This system of what was virtually dual farm management or, as Prime Minister Khrushchev put it, "two bosses on the land," created a great deal of friction and inefficiency, and made it difficult to pinpoint responsibility.

Early in 1958 the Soviet Government decided to do away with the dual management and to transfer the vital functions of MTS to the collectives. Arrangements were made for the collectives to purchase from the MTS the tractors and other machinery needed and to absorb many of the MTS workers and specialists. In 1958, therefore, the majority of collectives began to operate their own machinery. A minority of the economically weak collectives are to acquire the machinery more gradually. At the same time, the remaining parts of the MTS were transformed primarily into repair and service centers which supply the collectives with spare parts, major repair services, new machinery, fuel, fertilizer, and other production supplies. The MTS also rents out such machinery as the collectives need to use only occasionally. All the collective farms visited by the economics group had already acquired the machinery from the MTS, partly for cash and partly on credit. No opposition to this reform was found, although resistance apparently existed in some groups at the time of its adoption.

The advantage of the transfer of machinery to the collectives hardly can be disputed

from the standpoint of increasing managerial efficiency, especially if the skilled workers and technicians of the former MTS are integrated properly on the collective farms. On the other hand, a new financial obligation is placed on the collectives for the purchase, upkeep, and operation of the machinery. Only time, therefore, can disclose the full economic effects of the reform.

State Farms

State farms, as their name implies, always have been owned and operated by the state, with labor hired in the same way as in a Soviet factory. Workers on state farms, unlike members of collective farms, are paid regular wages, which are reported as being comparable with wages in industry. On the state farms that were visited, wages for ordinary farmwork ranged from 600 to 800 rubles per month. In addition, each household was usually allotted a garden plot and the privilege of keeping livestock for home use.

On January 1, 1958, there were 5,900 state farms with a sown area of 123 million acres, or an average farm size of more than 20,000 acres.¹¹ Thus, a typical state farm is even more of a giant enterprise than the collective farm, which averages about a fifth of the sown area of the state farms. State farms, therefore, also are divided into subunits and the workers are organized in brigades for more manageable operation.

Although the state farm sector, as a whole, plays a more prominent part in growing field crops than in producing livestock, livestock production is by no means neglected and is increasingly stressed by the Government, including supplying of milk and poultry products to the urban population. Sheep production is also important on some state farms. Since the fall of 1958, the Government has been assigning certain state farms to specialize in potato and vegetable production for supplying large cities at low cost.

The state farm sector, which for a long time played a subordinate role in the Soviet agricultural economy, has been gaining in importance in recent years. This gain was caused mainly by the acreage expansion on the new lands in the eastern region, where 425 new state farms were organized, and, to a lesser extent by conversion of a number of collective farms into state farms. The exchange group was told that conversion has occurred largely where there was excessive war damage, where the collective had an inadequate labor supply, or where large investments of capital were necessary. Under these conditions, the state would consolidate collectives and mechanize operations more fully. The sown area of state farms (including research farms and other state enterprises) increased from about 12 percent of the total in 1953 to more than 25 percent of the total in 1957. We were told on several occasions, however, that no general conversion from collective to state farms is contemplated.

CROP PRODUCTION

One of the most striking aspects of Soviet agriculture is the huge acreage planted to crops and the large percentage of the present cropland area that appears to possess high natural fertility. The terrain over much of the cropland area is relatively level or gently rolling. It is, therefore, well adapted to the use of machinery, and water erosion losses are minimized.

With an abundance of fertile cropland available for production, one begins to look for reasons why the yields per acre of food and feed crops have been relatively low during much of the history of the country. The answer appears to be partly the climatic

reasons discussed under Land, Climate, and Soils section. But production practices, farm organization, and economic incentives also must carry their share of the blame. As already indicated, much of the cropland area on the Chernozem and Chestnut soils receives limited amounts of moisture. Frequently, the southern and eastern areas experience severe droughts that sharply reduce crop outputs. In the northern areas of crop production, severity of winter temperatures and short growing seasons limit production to hardy winter rye or to spring-seeded crops of short maturity. Moreover, use of manure or commercial fertilizer is essential for high yields in the podzolic soil areas. A number of published Soviet statements indicate insufficient use of fertilizer in these areas.

¹¹Sel'skoe Khozyaistvo, September 26, 1958. A verbal report by Ministry of Agriculture officials gave 25,200 acres as the average sown acreage on State farms on the same date.

TABLE 5.--Acreage sown to selected crops in U.S.S.R., 1950, and 1954-57

Crop	1950	1954	1955	1956	1957
	Million acres	Million acres	Million acres	Million acres	Million acres
Winter wheat.....	30.9	38.8	45.2	31.9	46.0
Spring wheat.....	64.2	83.0	104.3	121.3	124.8
All wheat.....	95.1	121.8	149.5	153.2	170.8
Rye.....	58.3	50.7	47.2	45.5	45.0
Barley (winter).....	1.0	1.0	1.5	1.5	1.5
Barley (spring).....	20.3	25.5	23.0	27.9	22.7
Oats.....	40.0	39.3	36.6	37.3	34.6
Corn for all purposes ¹			44.2	59.1	45.2
Corn for grain.....	11.9	10.6	(22.5)	(23.0)	(14.3)
Buckwheat.....	7.4	6.9	6.9	6.7	6.2
Millet.....	9.4	13.6	19.0	15.8	8.9
Sunflowers.....	8.9	10.0	10.5	11.1	8.6
Cotton.....	5.7	5.4	5.4	5.1	5.2
Potatoes.....	21.3	21.5	22.5	22.7	24.2
Flax for fiber.....	4.7	2.7	3.7	4.7	4.2
Sugar beets for sugar.....	3.2	4.0	4.3	5.0	5.2
Total, above crops.....	287.2	313.0	374.3	395.6	382.3
Annual grasses including corn for green feed.....	17.3	23.2	36.3	51.4	50.2
Perennial grasses.....	27.7	39.8	33.9	30.4	32.4
Total, grasses.....	45.0	63.0	70.2	81.8	82.6
Total, above crops and grasses ²	332.2	376.0	422.8	441.3	434.0
Total, all crops.....	361.5	410.5	459.1	481.1	478.6

¹ Data prior to 1955 not separated into corn for grain and corn for all purposes. Acreage sown for purposes other than grain considered to be small.

² Excludes corn for all purposes; includes corn for grain.

Crops

Table 5 was compiled from statistical data made available to the agricultural economist exchange group. The acreages planted to major crops in 1950 and in the years 1954-57 are shown in this table. Not all crops are included, and, therefore, the totals are somewhat less than the reported sown acreage. Table 6 indicates that more than half of the acreage of all crops produces food grains and potatoes.

Wheat.--Wheat occupies the largest acreage, accounting for about one-third of the land planted to crops. The great expansion of the wheat acreage has been a major recent agricultural development in the Soviet Union. As a leading wheat exporting nation, the United States is interested in the increased Soviet wheat acreage.

Between 1950 (when the acreage was still below the prewar year 1940) and 1957, Soviet wheat acreage increased by 76 million acres, or 80 percent. This expansion occurred chiefly after 1954 by plowing up virgin and long uncultivated land east of the Volga River and the Ural Mountains in the subhumid and semiarid zones.

Winter wheat production is concentrated in the Ukraine, Moldavia, and northern Caucasus regions. The much larger spring wheat acreage is located largely in the Kazakhstan, and in the Volga and western Siberia areas. Yields in the Ukraine and the northern Caucasus probably average well above the other wheat-producing areas, with most years producing satisfactory to excellent yields. But severe winterkilling occurs in some years, as in 1956.

TABLE 6.--Acreage sown to food grains and potatoes in U.S.S.R., 1950 and 1954-57

Crop	1950	1954	1955	1956	1957
	<i>Million acres</i>	<i>Million acres</i>	<i>Million acres</i>	<i>Million acres</i>	<i>Million acres</i>
All wheat.....	95.1	121.8	149.5	153.2	170.8
Rye.....	58.3	50.7	47.2	45.5	45.0
Buckwheat.....	7.4	6.9	6.9	6.7	6.2
Millet.....	9.4	13.6	19.0	15.8	8.9
Potatoes.....	21.3	21.5	22.5	22.7	24.2
Total.....	191.5	214.5	245.1	243.9	255.1
Percentage of total selected crops (including grasses).....	57.6	57.0	58.0	55.3	58.8
Percentage of total, all crops..	53.0	52.2	53.4	50.7	53.3

The new-lands spring wheat areas, especially Kazakhstan and the Volga areas, and to a lesser extent in Siberia, are subjected to rather wide variations in rainfall. Wide fluctuations in crop yields, therefore, can be expected. Wheat yields were relatively good in these areas in 1954, 1956, and 1958. The yield prospects were exceptionally good when the exchange group visited some of the new-land areas in late July 1958. On the other hand, 1957 and especially 1955 were years of severe drought and low yields.

Nevertheless, the expansion of wheat production into the new-land areas with the outturns received to date (1954-58) has provided large additional quantities of wheat, especially in years of sufficient rainfall and a good growing season like 1956 and 1958. But the expectation of growing large quantities of durum wheat on new land has been disappointing. Durum wheat, incidentally, was introduced into the United States from Russia. During our visit we were told of the adverse effect of spring frosts on this crop.

It remains to be seen if the average level of yields attained during 1954-58 can be maintained when the new lands are no longer new and, particularly, what the effects might be if a prolonged moisture shortage occurs. Soviet authorities recognize that a considerably larger proportion of cropland in these subhumid and semiarid regions should be summer fallowed each year in order to store moisture and to increase availability of soil nutrients. If a larger proportion of the new-land area

is summer fallowed, the acreage seeded to wheat will decline unless more new land is brought under cultivation or unless wheat is substituted for feed crops, which seems unlikely.

In any event the Soviet Union is likely to plant a much larger acreage to wheat in future years than in the early 1950's. In conjunction with a large rye acreage, this means a higher capability for wheat exports, especially following years of good crops. However, much will depend also upon whether or not a considerably larger proportion of the wheat crop will be used to bolster the animal feed supply in order to increase livestock production, which is an important objective. We were informed that, at present, little wheat is used for animal feeding. Large quantities of low-grade wheat could be absorbed for this purpose if the authorities decided to do so. There are also indications of considerable stockpiling of the large 1958 crop. But once the carryover has been built up, the stockpiling demand on current production will be reduced unless several successive years of poor harvests are encountered.

Rye.--Many similarities occur between wheat production in the Soviet Union and the United States, but production of rye points to a striking difference in the cropping patterns of the two countries. In the United States, rye is a very minor crop, whereas, in the Soviet Union it is an important food grain. Fall-seeded (winter) rye is grown principally on the podzolic soils of the northwestern and north-central regions and in the eastern regions, where



N-29285

Soviet farm officials inspecting a field of spring wheat in northern Kazakhstan.

it is possible to seed winter grain. Rye is a hardy, fairly drought-resistant crop that is adapted to soils of low fertility.

The rye acreage has decreased in recent years from a peak of 59 million acres in 1951 to 45 million acres in 1957-58, a reduction of nearly a fourth. It still ranks third in acreage among the crops, exceeded only by wheat and corn. Soviet authorities told the exchange group that no further

significant reduction in rye acreage is planned.

Potatoes.--The potato acreage in the Soviet Union is about 15 times as large as the average acreage in the United States. The acreage has been increasing in recent years. Moreover, potatoes are one of the few crops in which private farming still plays a significant part. In 1956, half of the acreage was in household allotments of

kolkhozniki and others. Although potatoes are a very important food crop, considerable quantities are used for livestock feed on collective farms and also for production of alcohol.

Corn.--Corn formerly was a minor crop in the Soviet Union, but beginning with 1955, the acreage has increased significantly. Government programs have emphasized corn to bolster the supply of livestock feed and to permit further expansion of the livestock industry. The increases in corn acreage came at the expense of oats, barley, grasses, and summer fallow land. Much of the expansion occurred in the Ukraine and northern Caucasus. These areas seem fairly well suited to the production of corn for grain, although climatic conditions are not so favorable as in the central Corn Belt of the United States.

In recent years corn is grown not only for feed grain but also as a fodder crop in the areas where corn will not mature. Consequently, some corn is grown in nearly all farming areas. In the northern areas, it is planted only for silage and green or cured fodder. It seems doubtful that over a period of years corn will produce more feed per acre than alternative forage crops in the northern farming areas.

Cotton.--In 1958 cotton was grown on about 5 million acres. The Soviet Government plans to increase the acreage as new irrigation is developed. Most of the cotton is produced in the Uzbek S.S.R. and the adjacent central Asiatic Republics. About two-thirds of the cotton is grown in Uzbek. The 1957 yield was reported as averaging about 1,800 pounds of seed cotton per acre, with an outturn of 630 pounds of lint.



N-28919

A field of cotton being cultivated on a State farm near Tashkent.

As all of the cotton is grown under irrigation, these yields should be compared with the southwestern irrigated areas in the United States. The growing season in Uzbek

frequently is cut short by cool weather in the spring and early fall, but the reported yields compare favorably with the yields in irrigated areas in this country.

Cotton is fertilized heavily. Most cultural operations are mechanized, but hand-thinning and hand-hoeing are practiced. A considerable acreage of cotton is now being check-rowed for cross cultivation. The rows are about 2 feet apart. Although some mechanical cottonpickers are in use, about 85 percent of the cotton is hand-harvested.¹²

Sunflowers.--This oil crop is grown on about 11 million acres and supplies about 60 percent of the edible oils and fats for the Soviet Union. Very few soybeans are grown in the Soviet Union, and, therefore, sunflowers might be considered as taking the place of soybeans in the United States. Harvested acreage of soybeans in the United States averaged about 14.5 million acres from 1947-56; however, over 23 million acres were harvested in 1958. The Soviet Research Institute for oil crops, with headquarters at Krasnodar, has made remark-

able progress in breeding disease-free sunflower varieties, with a high oil content. Production and harvesting operations also are fairly well mechanized. Consequently, sunflowers constitute an efficient source of edible oil. Sunflowers are given high priority, but breeding work is under way on many other oil crops. The Soviet Union plans to increase production of flax and of castorbeans for oil.

Production Practices

Crop production practices have undergone significant changes in the U.S.S.R. during recent years. More machinery is used in preparing the land, and in planting small grains, corn, cotton, sunflowers, and grasses, but hand labor is required for planting sugar beets, potatoes, and tobacco. Cultivation practices were reported as largely mechanized, but much hand labor was observed in weeding and hoeing activities. Haying operations are practically all hand labor, even

¹² See also, "Survey of the Cotton Industry in the Soviet Union," U. S. Department of Agriculture Unnumb. Pub. [In press 1959]



N-28867

Collecting straw is an important part of the harvest on the Lenin collective farm near Taganrog. Women distribute straw in the catcher at the rear of the combine. Harvest operation requires five people per 16-foot cutting unit.

much of the mowing. Harvesting of small grains is well mechanized, but later handling of the grain requires much hand labor with only limited use of mechanical equipment. Sixty percent of the grain harvest is accomplished by the two-phase method of windrowing and later harvesting with combine pickup attachments. This method is well suited to areas where the harvest frequently suffers from inclement weather.

Crop rotations are practiced throughout the Soviet Union. They are usually of a long-term nature, running from 8 to 11 years, but the rotation cycle may be interrupted before completion. Rotations generally consist of a majority of years in small grains (or cotton in the cotton producing areas) with limited use of annual and perennial grasses, intertilled crops, and

summer fallow. Croplands are usually plowed to a depth of 4 to 5 inches in preparation for planting, but deep plowing to a depth of 10 to 12 inches is practiced every fourth or fifth year.

Small-grain seeding rates average much heavier in the Soviet Union than in the United States. Wheat-seeding rates range from 1.7 bushels per acre in the drier areas for spring wheat to 3.0 bushels per acre in the more humid areas. The heavier seeding rate frequently was obtained by cross drilling the fields.

Mineral fertilizers are being used in increasing quantities. The present level of use is about 2.5 million short tons of plant nutrients, or about 40 percent of the 1957 level in the United States. Plans are under way to increase the production and use of



N-28962

Two members of the U. S. economics research group, together with local workers, inspect irrigated cotton on a State farm, near Tashkent. The pile of fertilizer in the foreground is to be used as sidedressing.



N-28957

A 4-row fertilizer distributor attachment on a general-purpose tractor equipped with steel wheels with lugs distributes a sidedressing of superphosphate fertilizer on cotton. The superintendent of this State farm estimated the crop at 2 bales per acre.

mineral fertilizers. So far, their application has been confined largely to sugar beets, cotton, and flax. The shortage of rainfall over much of the southern and eastern regions, including new-land areas, appears to be a limiting factor in extensive use of commercial fertilizers.

Cropland in the more humid northern and western regions requires fertilization in order to produce satisfactory yields. This is generally done by the use of manure. It

will continue to be important as the livestock industry expands, but it is in these areas of podzolic and peat soils that liberal use of mineral fertilizer (and liming where needed) is likely to be most effective in increasing crop yields.

Future Expansion

The Soviet authorities indicated that efforts will be made to increase crop yields

not only by use of more fertilizer but also by the adoption of a number of improved production and cultural practices. One of the obstacles they will face is that crop yields are dependent on the considerable variations in climate throughout the Soviet Union.

During favorable seasons, the natural fertility of the Chernozem and Chestnut soils is capable of giving good to excellent outturns. However, before any crop reaches maturity, light to severe losses may be caused by lack of moisture, by severe winter temperatures, by late-spring season, by late-spring or early-fall killing frosts, or by excessive moisture at harvesttime. Seldom does a crop escape yield reductions from one or more of these causes. Some of these hazards can be reduced by adoption of improved cultural practices and by breeding crop varieties better adapted to the environment or by selecting crops suited to the growing conditions of each area.

The vast areas of widely different production conditions, the unknown degree of beneficial or harmful effects of weather, and the absence of reliable historic production data make it extremely difficult to estimate crop yields for the Soviet Union. Reliable production data have been lacking for many years. The crop growth observed by the agricultural economics group in 1958 probably was one of the most favorable ever produced in the Soviet Union. This favorable condition would tend to bias upward an evaluation of normal yields if it were based largely on observations. However, year-to-year yields in even the most favored producing areas would show considerable variation.

Winter wheat yields probably could be expected to range from average area yields as low as 12 to 15 bushels per acre in one area to 30 to 35 bushels per acre in another, depending on growing conditions in a given year. An average yield of 15 to 20 bushels per acre in the winter wheat producing areas would appear reasonable. The spring wheat producing areas are subjected to rather wide extremes of weather that result in sharp yield changes from year to year. For example, the wheat yields reported for the Akmolinsk Region for the years 1953-58 ranged from 3.7 bushels per acre in 1955 to 19.3 bushels expected in 1958. The variable but always limited precipitation and the relatively short growing season tend to hold average yields at relatively low levels. Average spring wheat yields of 8 to 10 bushels per acre appear reasonable.

Rye is generally produced on lighter soils than is winter wheat, and average yields for recent years should not be placed above 12 to 14 bushels per acre. The yield differential expected in the United States between wheat and barley or oats was also evident in the Soviet Union. Generally, the oat and barley yields were quoted at one and one-half to double the wheat yields on the basis of the standard United States bushel measure. Corn yields for most recent years averaged good to excellent in the southern areas of production, with yields on some farms reaching 90 to 100 bushels per acre. However, as an area average, yields in the more favorable locations probably could be expected to average no more than 40 to 45 bushels per acre. In the central and northern areas, an increasing percentage of the corn is planted for fodder or silage and grain yields are low. An average corn-for-grain yield for 1958 of 20 to 25 bushels appears reasonable, with earlier years probably averaging as much as 5 bushels less.

Extremely heavy yields of corn for silage or green fodder in recent years were occasionally reported. However, the average yields are probably relatively low because (1) a considerable acreage is planted after the small-grain harvest in southern areas, and (2) the acreage planted in northern areas has a relatively short growing season. Average yields of 5 to 6 tons of silage per acre appears to be the upper limit.

Improved varieties, greater use of fertilizer, improved cultural practices, better harvesting and grain handling facilities, and more extensive use of irrigation and summer fallow may increase yields. Plant breeders in the Soviet Union are developing higher yielding varieties of grain with stronger straw to reduce lodging losses. Fertilizer use is being increased annually and may produce a significant increase in outturns on those crops to which it is applied. Irrigation projects currently under way or planned will bring about significant increases in acreages of cotton, fruit, and sugar beets, and may push yields to higher levels. Greater utilization of summer fallow in the drier areas, especially the new-land areas, will reduce the risk of severe crop failures and should result in average yield increases.

The net effect of the combination of the above-listed practices that will be used to bring about yield increases is difficult to anticipate. A modest increase of only 1 bushel of wheat per acre would mean 170 million bushels more wheat. This would be

equivalent to a 10-bushel yield on 17 million acres of additional land. An average yield increase of 2 bushels per acre seems quite feasible with application of the improved practices that are already known. Such increases in wheat yields could release land for the production of livestock feed unless the additional production was exported or used to build up reserve stocks. No information is available on carryovers, but it seems reasonable that rather large stocks need to be carried to tide over unfavorable crop years.

Estimates of aggregate crop production are especially difficult as official Soviet

data are lacking and yields vary greatly between producing areas and between seasons. Data on sown acreages for major crops are available as reported in table 5; and analysis of other fragmentary data may at least produce a reasonable measure of change in production from year to year.

The United States Department of Agriculture has prepared and published estimates of production for the major crops grown in the Soviet Union. Such estimates are used to provide world production estimates for various commodities. Production estimates for the Soviet Union for selected crops and years are shown in table 7.¹³

TABLE 7.--Estimated production of selected crops in the U.S.S.R., 1950 and 1954-57¹

Crop	1950	1954	1955	1956	1957
	<i>Thousand bushels</i>	<i>Thousand bushels</i>	<i>Thousand bushels</i>	<i>Thousand bushels</i>	<i>Thousand bushels</i>
Wheat (All).....	1,020,000	1,340,000	1,550,000	2,000,000	1,800,000
Rye.....	725,000	735,000	700,000	625,000	600,000
Oats.....	870,000	900,000	900,000	875,000	800,000
Barley.....	340,000	335,000	450,000	525,000	400,000
Corn for grain.....	270,000	150,000	575,000	500,000	300,000
	<i>Thous. bales</i>	<i>Thous. bales</i>	<i>Thous. bales</i>	<i>Thous. bales</i>	<i>Thous. bales</i>
Cotton lint.....	5,100	6,700	6,300	7,000	6,850

¹ Estimates made by the U. S. Department of Agriculture.

The production estimates in table 7 indicate that the Soviet Union produces much more food grains than we do in the United States. In fact, their tonnage of wheat and rye in 1957 was 246 percent of our production in that year. The estimated tonnage of three feed grains produced in 1957, however, was only 29 percent as large as our production of the three crops in that year. On the basis of our average feeding rates, the feed grains produced in the U.S.S.R. in 1957, plus allowance for byproduct feeds, would provide feed for only 47 million grain-consuming animal units. This compares with 161.5 million grain-consuming animal units fed in the United States in 1957. However, forage and root crops constitute a much larger proportion of the total livestock feed in the Soviet Union.

It appears that crop production in the Soviet Union can be expanded in three ways: (1) By adopting improved production practices to increase yields per acre, (2) by

adding more cropland which may require clearing, drainage, or irrigation, and (3) by developing cropping patterns better adapted to the climatic conditions of different areas. At the present time, the first method is receiving the greatest attention.

The Soviet Union has adequate resources for food grain production, although wide year-to-year fluctuations are to be expected. Feed-grain production, however, is likely to limit rapid expansion of meat animals unless yields per acre are increased or a part of the present food-grain acreage is used for livestock feed.

¹³ A figure for production of all grains, also including legumes, in 1958 was given by Prime Minister Khrushchev in his December 15 Report to the Central Committee of the Communist Party of the Soviet Union. He reported 8,508 million poods of grain and legumes, equivalent to 139.4 million metric tons, from an area of 125.2 million hectares, equivalent to 309 million acres. This estimate seems to be high even for the excellent crop outturn in 1958, but in the absence of more detailed data by individual grain crops and regions, it is impossible to form a definite judgment.

LIVESTOCK PRODUCTION

Production of livestock has never attained so high a place in Soviet agriculture as has grain and potato production. In the past, the Soviet diet has leaned heavily on cereals, potatoes, and other vegetables that are grown in household gardens.

The reason for relatively less emphasis on livestock production lies both in the general economy of the Soviet Union and in the nature of the agricultural resources. As a cereal diet is less expensive than one rich in livestock products, it is adapted to the relatively low incomes of Soviet people. Government policy for channeling a major part of national income into heavy industry rather than into personal living has contributed to the modest level of incomes and, therefore, to a cereal diet.

Natural conditions in U.S.S.R. favor the raising of food grains rather than feed crops. Natural pasture land is not extensive

in the farming areas, and a large proportion of the cattle are stall-fed the entire year. In addition, Government price policy formerly discouraged increases in livestock production, but more favorable prices have prevailed since 1953.

Present Practices

Private ownership of livestock by peasants as well as by some industrial workers is still an important factor in Soviet agriculture. Individual holdings account for almost half of all cattle, a third of hogs, and a fourth of sheep and lambs. The estimated numbers of livestock in the Soviet Union on January 1, 1958, are given in table 8, and for January 1, 1959 in table 30 in the Appendix. Data for the United States are shown for comparison.

TABLE 8.--Livestock numbers in the Soviet Union and in the United States on January 1, 1958

Item	Soviet Union				United States
	Collective farms	State farms	Individual holdings	Total	Total
	<i>Million head</i>	<i>Million head</i>	<i>Million head</i>	<i>Million head</i>	<i>Million head</i>
All cattle.....	29	8	29.5	66.5	94.0
Cows.....	--	--	--	31.4	¹ 46.8
Hogs.....	20	9	15.3	44.3	51.6
Sheep.....	--	--	--	120.1	31.3
Sheep and goats.....	71	24	34.5	129.5	34.2

¹ Comprises 22.4 million head for milk, 24.4 million head for beef.

The livestock kept as part of the collective and state farm operations are large-scale enterprises. The exchange group visited several large livestock centers where cattle, hogs, and poultry were kept.

Livestock breeding work is receiving much attention in the Soviet Union, and seems to be competently done. There is much cross breeding, and artificial insemination is common.

Every farm we visited has either a veterinarian or a veterinary technician. Vaccination and disinfection are relied on for disease control. Apparently, producing livestock in such large units has not led to

epidemics of disease. However, most infectious diseases are present in the Soviet Union and are a constant threat.

Dairying.--Among the livestock enterprises, dairying is farthest advanced in the Soviet Union. By contrast, there are no cattle of clearly beef type. Some milk cattle of dual-purpose type provide reasonably beefy steers and heifers for slaughter. All other beef is of dairy origin.

Dairy cattle are either native breeds--most often Red Steppe, but sometimes others, such as White Headed Ukrainian--or crosses of imported and native stock--usually Simenthal (Swiss cross) or Kholmogorsk (Friesian cross).



An attendant exhibits a high milk-producing Seminthal cow at an animal husbandry experiment station. The Seminthal, a Swiss cross, is a dual-purpose animal and is quite popular in the Soviet Union.

Most cattle barns have a capacity of 100 to 200 cows, and there may be 1 to 3 or more barns at a single cattle center.

Milk production per cow in the Soviet Union was reported as averaging about 4,000 pounds in 1957. On collective farms, the average was 4,100 pounds and on state farms, 5,950 pounds. Privately owned cows had a lower milk flow. Average milk production per cow in the United States in 1957 was 6,162 pounds.

Until recently, milk yields in the Soviet Union were lower in herds on collective farms than for privately owned cows. Both were low. Officials report that improved feeding and care have lifted the production level of collective herds the last few years.

Total milk production in the Soviet Union in 1957 was officially reported as 121 billion pounds. Of this, $4\frac{1}{2}$ billion pounds was from sheep and goats, and almost 117 billion pounds was from cows. These estimates may overstate actual production, partly because production from privately owned cows may be less than the official estimates. In the United States, 126 billion

pounds of milk were produced in 1957.

Meat Production.--The Soviet Union is much farther behind the United States in the production of meat than of milk. In 1956 the total output of dressed meat, including poultry meat, was reported as 14.6 billion pounds for the Soviet Union. Even this figure may overstate actual production, because data are not reliable on the private sector. Production in the United States in the same year was estimated at 36 billion pounds. The official estimate of total meat production in the Soviet Union was about 40 percent of United States production in 1956. Because of a larger population, the meat available per person in the Soviet Union is probably about one-third of the per capita quantity available in this country.

Data on meat, egg, wool, and butter production in the Soviet Union and in the United States for 1956 are shown in table 9.

Hog production in the Soviet Union resembles that in the western Corn Belt and the northern Plains of the United States. Two systems of raising pigs are used: The nucleus system of two litters yearly, and a

TABLE 9.--Comparisons of meat, egg, wool, and butter production, Soviet Union and United States, 1956¹

Item	Unit	Soviet Union	United States
Livestock and poultry slaughter.....	Bil. lb. live weight	23.6	57.9
Meat production (incl. poultry).....	Bil.lb. dressed weight	14.6	36.0
Beef and veal.....	.....do.....	5.2	16.1
Pork (carcass including lard).....	.....do.....	5.9	14.0
Lamb, mutton, and goat meat.....	.....do.....	1.8	0.74
Poultry meat.....	.....do.....	² 1.7	5.2
Egg production.....	Billion eggs	19.5	65.7
Wool production.....	Million pounds	575.0	279.0
Factory butter production.....	.....do.....	1,224.0	1,413.0

¹ Data from official sources.

² Assumed by subtraction.

one-litter system in which gilts are bred at 8 to 9 months of age and are slaughtered after farrowing. Farrowing dates most often reported in central and southern regions are February-March and August-September for the nucleus system, and April-May for the one-litter system.

Most hogs appear to belong to the large white or white-spotted breeds. In type, they appear fat and lardy, as compared with the hogs now produced in the United States. Formerly, hogs were marketed at weights approaching 300 pounds, as Soviet consumers preferred fat pork. More recently, the Soviet Government has encouraged sale at 200 to 220 pounds.

Hog barns are large. Some of the farrowing barns consist of one farrowing pen after another, each 6 to 8 feet square. Often guard rails are lacking, but some have a creep arrangement that offers some protection against crushing of pigs.

After weaning, pigs are moved to the growing and fattening barns. They may be held in one barn throughout the entire feeding period, or they may go first to a growing barn, and later to a separate fattening barn. Several hundred hogs are held in one area. They may have an exercise lot, but they are seldom grazed.

Poultry production has not advanced far in the Soviet Union. Large poultry farms near the bigger cities show evidence of progress, but most of the poultry are raised in small household flocks. Even on the large poultry farms, feedhoppers are small and require frequent attention. Much labor is required for both egg and poultry-meat production. Only a few farms are ex-

perimenting with radical departures in poultry raising. One farm observed by us at Adler on the Black Sea, for example, is far advanced, both with respect to economy of buildings and with labor-saving equipment.

Although chickens predominate, ducks and geese are much more numerous in the Soviet Union than in the United States. Most household poultry flocks range freely and are given little care. They probably obtain much of their food supply by functioning as scavengers.

Dryland grazing areas in the Soviet Union are used mostly for grazing sheep. Some sheep are raised also in mixed-farming areas. Fine-wooled breeds are replacing the "fat-tailed" or "mutton-fat" coarse-wooled sheep. Types and breeds of sheep vary by area, as follows:

Area	Breed and type of sheep
West of Caspian Sea	Fine-wooled.
Kazakhstan.....	Tonkoroonya (fine-wooled). Korduchnya (coarse-wooled).
Middle Asia (Turkmen S.S.R., Uzbek S.S.R., Kirgiz S.S.R.).....	Tonkoroonya (fine-wooled). Karakul.
Mixed areas	Chiefly fine-wooled or certain specialty breeds, as for sheepskins or Karakul pelts.



N-28887

This hog farm near Krasnodar maintains 600 sows of a large, white breed. The Russians, as in the United States, are developing breeds that are lighter in weight and leaner. Exercise of stock, as shown here, is rare, as most hogs are raised under close confinement.

Grazing and Green-Chop System.--Grazing of livestock is much less widely practiced in the Soviet Union than in the United States. In the forested areas of the north, milk cattle are grazed during the summer. There are few fences, if any, and the cattle on pasture are tended by herders. On the farms we visited in the steppe areas, both cattle and hogs are barn-fed the year round. Cattle are grazed on native pasture, however, in some of the eastern new-land areas and in the semiarid grazing lands of the south-central and eastern regions.

The climate of the steppe areas probably is better adapted to food grains than to production of most feed crops. This has presented a problem. The solution pursued has taken two forms: To raise more corn and to feed green-chop forage, in what is termed the "green-conveyor system." In this system, a succession of crops is cut green and hauled to the barns for feed. They begin with winter rye or oats in the spring, continue with perennial forage crops during the summer, and end with corn or pumpkins and squash or root crops during the fall. This



N-28930

Leghorn flocks are fed with small self-feeders at a State poultry farm near Leningrad.

system is economical of land, especially in the south where double-cropping is possible, but it is very laborious. An extremely heavy tonnage of feed must be cut and fed daily. To date, this harvesting has been done to a large extent by hand.

Future Goals

The Soviet authorities have set a goal of catching up with the United States in production of milk by 1960, and of meat by 1962. If weather conditions are favorable for feed production, the goal for milk may be within reach. Production methods are improving; herds are being expanded; and breeding is being improved. But when the goal for total milk production is achieved the problem of utilizing more of the nonfat solids for human food will still remain;

also that of improving milk distribution in the cities and towns.

The meat output goal for 1962 was originally more than 3 times the 1956 production. This appears to be an unattainably high goal, at least for so short a period. The Soviet Union's capacity for production of livestock products is severely limited. Soviet agriculture is primarily extensive. It will always be difficult to produce enough feed to support a livestock industry as large as the present leaders envision. That the Soviet Government itself is aware of the unrealistic character of the high meat goal can be seen from the scaling down of the target for meat production in the Seven-year Plan, 1959-65 to 16 million metric tons, or 35 billion pounds for 1965.

Soviet agriculture has developed the green-chop feeding of livestock as an answer

to the feed supply problem (see p.27). This system requires a great deal of labor. If more labor is shifted to nonfarm employment with the growth of industry, present feeding practices may have to be revised. Although mechanization of forage handling is possible, it may be more desirable to produce more feed grains. In fact, it seems doubtful that the Soviet Union can expand its livestock output substantially without a larger output of feed grains.

Production of feed grains in recent years has averaged about one-third of United States production. If the yield of all food grains should be increased about 2 bushels per acre, probably about 30 to 40 million acres could be released from grain for food to grain for feed. This could mean a 50-percent increase in feed-grain output. Also, increasing the yield per acre of feed grains is possible. For example, improved varieties of grain sorghum probably would

produce more feed grain than either corn or small grain in the drier southern farming areas.

However, production of forage and of most feed grains in the areas of low precipitation may prove to be more hazardous than production of food grain. It seems likely, therefore, that livestock production will gradually gravitate toward the humid northern areas. These areas are more suitable for pasture, other forage, and root crops than for feed grains. But if transportation is made available, the feed grains grown in the drier areas can be shipped to the areas of more concentrated livestock production.

Considerable time is required to carry out shifts of the type that seem necessary for large increases in meat production. We conclude, therefore, that the Soviet Union will find it extremely difficult to meet the 1965 meat production goal.

LABOR SUPPLY AND UTILIZATION

The population of the Soviet Union is still more rural than urban, despite extensive industrial development and rapid increase of the urban population. In April 1956, the rural population was 113.2 million, or 56.6 percent of the total of 200.2 million people.

No data have been published on the total number of workers in agriculture. A figure of 43 percent has been published as the percentage of the population in agriculture and forestry, but no figures are given on the working force.¹⁴ The following estimates, which have been developed from various sources, portray the general work-force structure in agriculture in 1956:

Thousand workers

State farms (including farmworkers on various State institutions)	2,949
Machine-tractor stations	2,953
Collective farms	¹⁵ 27,555

Total able-bodied workers in agriculture except forestry. 33,457

¹⁴ See "40 Years of Soviet Power in Facts and Figures," diagram 2, and table on p. 19.

¹⁵ Estimate derived by dividing the published figure of 117.1 million horsepower of power capacity in agriculture by the published figure of 3.5 horsepower per worker on state and collective farms and machine-tractor stations (pp. 136 and 137, of "40 Years of Soviet Power," Moscow, 1958.) Figures for state farms and machine-tractor stations taken from *Narodnoe Khozyaistvo SSSR v 1956* Godu, pp. 146, 150. Collective farmworkers then computed as a residual.

There can be no certainty about these data, because other Soviet sources give different figures. Presumably the figures given above do not include members of peasant families working only on household allotments, nor the so-called non-able-bodied kolkhozniki, that is, males and females from 12 to 15 years old, males over 60 years, and females over 55 years who earn workday units on farms. It seems to be the consensus of western students of Soviet manpower that the total agricultural labor force is considerably larger than 33.5 million.

We were told that about 60 percent of the workers in agriculture were women. This was about the average percentage on the 15 State and collective farms that we visited. Women traditionally have done a large part of the work on the farms.

Even though the derived figures are only an approximation of the farm labor force and although women make up a large part of it, the conclusion is inescapable that Soviet agriculture has a huge labor force.

The rotation cropland area of the Soviet Union is given as 204 million hectares, or 504 million acres, compared with about 400 million acres of cropland in the United States on a roughly equivalent basis. Soviet agriculture thus has one worker for about 15 acres of cropland, whereas in the United States there is an average of about 60 crop-



N-28898

Russian women winnowing grain.

land acres per farmworker.¹⁶ Thus, the average farmworker in the United States handles about 4 times as much cropland as the farmworker in the Soviet Union. This difference in intensity of labor use in the United States and in the U.S.S.R. is partly related to the greater amount of mechanization in United States agriculture, partly to the way agriculture in the Soviet Union is organized, and partly to the availability of labor in rural areas in the Soviet Union. Despite rapid industrialization, labor has not been drawn into nonfarm employment to the same extent as in the United States.

The conclusion of high labor use per acre is fortified by data collected on 13 collective

and state farms in the summer of 1958. One would expect to be shown better than average farms, yet the cropland acreage per full-time worker on these 13 farms was 16.3 acres, not much above the average for the Soviet Union. A wide variation in labor use occurred among farms, as would be expected--from 3.2 acres per worker on a state farm specializing on cotton in the Uzbek S.S.R. to 106 acres per worker on a large collective farm in the new-land area producing mainly wheat. For each type of farm visited, the ratio of 3 or 4 Soviet workers to 1 U. S. worker on a similar type of farm was evident.

The Soviet Union farm, however, is more self-sufficient in terms of producing food for its workers and family members than is the typical family farm in the United States. On the other hand, Soviet agriculture produces relatively much less food that requires intensive labor expenditures for

¹⁶ Based on employment in agriculture of 6,585,000 workers as reported by U. S. Census for 1956. This figure was used instead of the larger one of 7,869,000 employment published by USDA because the USSR data do not include seasonal and part-time employment of students, or family members not regularly in the work force.

such products as meat, fruits, and truck crops, which would add to the labor input when measured in terms of cropland area. No data are available with which to compare labor productivity in the two countries on a total output basis on comparable terms. It seems likely that if such a comparison were possible, the conclusion would still be that labor productivity would be in the general ratio of at least 3 or 4 to 1 as reflected in the above figures on numbers of acres of cropland per farmworker.

This conclusion is reinforced by applying the average labor performance rates for individual crop and livestock enterprises in the United States that are comparable to enterprises in the Soviet Union. A total of 8.5 billion man-hours is derived in this way (excluding vegetables, fruits, and nuts in both countries). This compares with 9.6 billion man-hours for comparable enter-

prises in the United States. If the further assumption is made that farmworkers in each country work the same number of hours per year, the ratio of labor productivity is 6 to 1 in favor of the United States. This is an even wider ratio than the one based on cropland per worker.¹⁷

These comparisons reflect the present stage of labor organization and use in the Soviet economy. It is not difficult to visualize the farm production job being done with far fewer people than are now on farms. One gets the definite impression that large amounts of labor are used for some jobs in relatively slack seasons merely because the labor is on the farm. Perhaps the reasoning is that it is better to provide useful employment than to let the labor remain idle. From an American viewpoint, however, it would be desirable to release many of the women workers for homemaking duties in the slack seasons.

PROGRESS IN MECHANIZATION

The Soviet Union made rapid strides toward mechanization of its agriculture in the decade before World War II. But so much destruction and deterioration occurred during World War II that, in general, the numbers of tractors, trucks, and other principal farm machines were not much higher in 1951 than in 1941 (table 10). Since 1950, mechanization has resumed its prewar pace. Between 1951 and 1957, the number of tractors on farms increased 50 percent, the number of trucks 123 percent, and the number of grain combines 87 percent. Mechanization of the heavier farming operations is progressing, especially in land preparation and in cultural and harvesting operations in grain crop production.

Farm machinery in the Soviet Union is not nearly so numerous nor are the machines of such wide range in sizes and adaptability as those in the United States.

The farm machinery impresses the American observer as being heavy and cumbersome.

The 892,000 tractors in 1957 compare with 4,600,000 on United States farms on the same date. The acreage of cropland per tractor was 565 in the Soviet Union and 87 in the United States. Crawler tractors constitute a much higher percentage of tractors in the Soviet Union than in the United States. Numbers of row-crop tractors are increasing rapidly but probably

still constitute much less than half of the total. One machine repair and service station director indicated that half or more of tractors would be crawler type for many years to come. This is partly because the crawler tractor is preferred for plowing and partly because much of the crop area is in small grains, with relatively smaller acreages of row crops to be handled than in the United States.

It is difficult to determine the adequacy of tractor numbers in the Soviet Union. The organization of agriculture into large units with generally large fields no doubt makes possible the handling of much larger acreages per tractor for such jobs as plowing than is possible on many farms in the United States. Plowing, sowing, and small-grain harvesting are done almost entirely by tractor power, but whether more tractors would make for greater output through more timely operations is conjectural. Most tractors and major machines are equipped with lights for night-time operations, and apparently are frequently so used. In any event, tractor numbers are being increased.

¹⁷ In his December 15 Report to the Central Committee of the Communist Party of the Soviet Union, Krushchev compares labor expenditures per centner (220.46 lb.) of different agricultural products in the United States and the Soviet Union. He sums up by saying that in the Soviet Union the expenditure of labor on state farms amounted to 80 percent more per centner, and on collective farms 630 percent more than in the United States.

TABLE 10.--Number of principal machines in agriculture in U.S.S.R., selected years (beginning of year)¹

Type	1941	1951	1956	1957
	<i>Thousands</i>	<i>Thousands</i>	<i>Thousands</i>	<i>Thousands</i>
Tractors.....	531	595	844	892
Trucks.....	228	283	544	631
Grain combines.....	182	211	338	385
Tractor plows.....	491	519	704	718
Tractor seeders.....	312	352	709	829
Tractor cultivators.....	272	317	616	(2)
Tractor hay mowers.....	17	52	299	(2)
Tractor rakes.....	2	9	78	(2)
Cotton harvesting machines.....	1	5	25	(2)

¹ Source: "The National Economy of the U.S.S.R. - A Statistical Compilation," Moscow, 1956, and "40 Years of Soviet Power," Moscow, 1958.

² Not available.

The production of tractors in 1956 in the U.S.S.R. was 184,000.¹⁸ Officials of the Ministry of Agriculture indicated a need for many more smaller tractors that are better adapted to the smaller, more hilly fields of the more northerly forested areas.

Although tractor numbers at present may be reasonably adequate, it is apparent that mechanization of the on-farm and farm-to-market transport is definitely inadequate by our standards. Much of the on-farm hauling is done by horse and wagon or even oxcart. This is a slow and inefficient method when speed is important at some seasons, particularly in view of the great distances to be covered from outlying fields to the village centers. This is frequently several miles on the large state and collective farms. Apparently, most of the farm-to-market hauling is done by truck, but here the poor condition of the rural roads is a severe handicap. The lack of adequate all-weather roads in much of the country no doubt explains in part the separation of cream for butter production on most farms rather than the marketing of whole milk. The inadequate transportation system also probably hinders the development of such other agricultural crops as fruits and vegetables. The relatively few trucks and automobiles (631,000 trucks and very few automobiles on farms in 1957, compared with more than 1 million trucks and over

4 million automobiles on U. S. farms) makes for cultural as well as economic isolation for the rural villages and their inhabitants. Real progress has been made, however, in the last 10 years or so.

Tractor plows, seeders, and cultivators appear to be in proportion to the number of farm tractors. So far as can be determined by observation, sufficient machinery is available to perform the cultural operations in producing crops on the state and collective farm fields in an adequate fashion. However, it is equally apparent that on smaller fields, and particularly on the private plots of land, machinery is either not available or is too expensive for use. A rather common sight is the cutting of hay or small grains by hand scythes in small fields or along highway and railway rights-of-way.

Haymaking, even on the collective farm fields, still depends heavily on human labor. Official statistics indicate that in 1955 only 49 percent of hay mowing on collective farms was done by machinery. This represents rapid progress, however, as only 17 percent was done by machinery in 1950 and 4 percent in 1940. Most of the handling of hay from the windrow to the barn is apparently still done by hand labor and horse-drawn carts and wagons. These are jobs in which practically the whole collective farm population can participate to some extent. Apparently it does -- judging from the large crowds of people of all ages we saw working in hayfields at several places on our trip.

¹⁸ "40 Years of Soviet Power," p. 71, Moscow, 1958. No information given on how many of the tractors produced in 1956 went to agriculture.

Despite the lag in mechanization of many farm operations, progress to date represents a real revolution in farming methods when compared with those that existed as recently as 1930. Machinery generally is much less available than in the United States, but the machines probably are used considerably more per year than in this country. Then, too, the compulsion for saving human labor is less, particularly on the collective farms. As pointed out earlier, the workers live on the farms; have little, if any, opportunity for off-farm employment; and generally are sufficient in number to handle the peak labor needs of the farm operation.

No direct cash saving is involved by mechanizing an operation which uses labor that otherwise would go unused. This is true for each collective farm, but from the standpoint of the total economy, further mechanization would release additional labor to

industry and trade. But this is a long-term effect and provides no specific incentive to the farm chairman or director to save labor at any one point in time. For instance, the pressure to save labor is so small that even for operations like plowing and seeding, one generally sees a man driving a tractor and another riding the plow or drill. Likewise, 4 or 5 workers are used to operate the combines. The combine-harvesting scene in the Soviet Union is reminiscent of the machines and work crews common in the wheat areas of the United States in the mid-1920's.

Further progress in mechanization doubtless will be made, especially if the growth of industry draws additional workers from farms. The desire to ease drudgery and heavy work also may provide a stronger incentive than direct economic benefits at the farm level.

FARM SERVICE BUILDINGS

No general statistics are available by which the adequacy of farm service buildings can be appraised. General statements by Soviet officials, as well as the observations of the exchange group, fortify the conclusion that farm service building construction has been a matter of great concern and has involved much activity in recent years. The rural areas along with the cities invaded by the Germans in World War II were faced with a large reconstruction job after the war. Many farm service buildings, therefore, as well as the homes of collective farmers, have been built in recent years. New buildings also were essential for development of the new-land areas. Construction of new farm buildings was evident in all the areas that were visited. In general, farm service buildings appear to be better constructed than the farm homes.

On the farms we visited, the most substantial, and therefore the most costly, farm buildings were the dairy barns. Most are built from a standardized pattern--a gable-roof structure providing for 2 or 4 rows of dairy cows, and with a capacity of 100 to 200 or more cows. These barns sometimes are built in groups of 3 or 4, and may house from 600 to 1,000 cows in one dairy farm unit. Materials differ, but generally the barns are substantially built of concrete block or similar material for the walls and with concrete feeding bins. Dairy barns frequently house the cows year round,

although some farms have open-shed summer barns in addition to the winter barns.

The general impression is that dairy barns look much alike all over the Union, with probably more expensive construction in many cases than was warranted. Several officials verified this observation by commenting that mistakes had been made and that more attention was being given to adequate but lower cost construction. The contrast was apparent between two farms near Leningrad--one farm had a concrete block dairy barn, with reinforced concrete floor for the hayloft above, that cost twice as much as a similar capacity barn on another farm, which had used wooden timbers for the aboveground supports and wooden flooring for the hayloft. No hay space is provided for most dairy barns; however, in some places we observed hot-water radiators for winter heating of the barns.

Only rarely did we see any upright silos. Pit silos of concrete construction are most common. They usually are square, and require much heavy hand labor to remove the silage. Frequently, the silos were located some distance from the barn, and additional labor was required to move the material.

Some milking parlor installations are being constructed, but this is a new development. Even on the farms we visited, some of the herds were still hand-milked. Where machine milking was practiced, the



Dairy barns are frequently the most substantial buildings on the farm. Materials are generally of concrete block or similar material, and is often stuccoed. At this dairy barn near Krasnodar, fodder beets are piled in front ready to be fed to the animals.

bucket-type machines were being used. We saw no pipeline milkers.

The hog houses we saw were usually shed or gable-roof wooden structures designed to house a large number of hogs in adjacent pens. The most elaborate hog feeding houses were circular, with high ceiling, and housed 400 to 600 feeder hogs.

Poultry houses were usually wooden, gable-roof structures, not unlike many in the United States. However, an experiment in poultry housing was noted on a specialized state poultry farm on the Black Sea coast. A two-story concrete-and-brick structure, housing 32,000 laying hens in cages, cost 50 rubles per hen capacity to build. In contrast, a one-floor wooden structure with wire floors, housing 30,000 birds, cost 12 rubles per hen.

Facilities for grain storage on farms are largely long one-story sheds, where grain is dumped on the ground or on a concrete floor. Most of the food grains are stored at shipping points or milling centers.

As the farm service buildings for large cropland areas are clustered in one or a few places on the collective and state farms, the impression is one of general adequacy. For instance, a collective farm with about 23,000 acres of cropland had 180 farm service buildings for housing livestock, storing machinery and feed, administration, and miscellaneous uses. Even when grouped into a number of centers, they made an impressive showing, yet they average 1 building for 130 acres.

Between 20 and 30 percent of gross sales of products on collective farms goes into the "indivisible fund," which is used for capital improvements--largely buildings and machinery. With the transfer of machinery from the machine-tractor stations to the collective farms, a large part of these funds will be used for at least a few years to make payments to the state for the machinery purchased. Even so, such withholdings of funds from distribution to collective farm members can provide for much in-



Although most hog houses are wooden structures, this hog house in the Kuban' area is substantially built.

vestment in farm service buildings. In addition, the state makes available 10-year loans at 3 percent interest for farm building construction.

A farm building design service organization operates in the Ministry of Agriculture. This service prepares plans for new

buildings and recommendations for changes in older buildings for more efficient operations. Use of this service, together with availability of funds for further construction, can result in significant improvements in both the adequacy and the efficiency of service buildings in future years.

TRANSPORTATION, STORAGE, AND PROCESSING FACILITIES

Of the impediments to increased output and the general improvement of Soviet agriculture, few exceed the lack of transport. Many farms are a long distance from railroad facilities. The unimproved roads from farms to urban areas become almost impassable in periods of rain or snow; only the arterial roads connecting major cities are satisfactory. They are chiefly black-top pavement. Almost all roads leading to farms are dirt roads. Some are graded occasionally, others are simply dirt trails.

Lack of good transport handicaps farm operations, but its even greater effect is in

forcing a geographic pattern of agriculture that is seriously uneconomic. It prevents the regional specialization that is so necessary to a highly productive agriculture. And it impedes the development of an efficient system for marketing of farm products.

Because Soviet farms are large, there is much transport within the farm, especially of forage to livestock centers. Good farm roads would make this easier and cheaper. The farms also are becoming increasingly "commercial," in that machinery, fuel, fertilizer, pesticides, and other supplies must be transported to them in increasing

volume. This transport also is made more difficult and expensive by poor roads.

If it were possible to move farm products readily from region to region, much more regional specialization could be introduced into Soviet agriculture. Feed grains could be shipped more readily from the surplus feed producing areas to specialized livestock areas. At present, every area, and in fact almost every farm, engages in livestock production. For some areas this is highly uneconomical. Also, there is too little regional specialization in production of fruit and, to some extent, of vegetables.

Lack of transport increases the difficulty of marketing farm products, and therefore interferes with the best utilization of production. For instance, outside the radius of large cities, all milk is separated into cream on the farm. The cream is then hauled to a creamery and the skim milk is fed to hogs on the farm. This system is identical with that which prevailed in the United States 30 years ago. It is wasteful of milk solids other than fat--a serious waste in a nation that needs to put more animal proteins into its high cereal diet. Better highway transport is necessary for moving whole milk to a central point for manufacture,

especially in areas where the farms are relatively small. Some of the large farms, however, could justify installation of fruit and vegetable canning and milk-drying facilities on the farm.

Because of poor transport, consuming centers are virtually cut off from supplies of foods that must come from distant sources. Fruit is scarce in much of the northern part of the Soviet Union, and fresh vegetables are rare at all times of year except during the local harvesting season.

In the important grain-producing areas, one is soon cognizant of the lack of adequate grain storage facilities. Farms have storage for only a very limited part of the crop, and their storage is largely of flat warehouse or shed type. Such storage appeared to give only partial protection from weather and very limited protection from insects and rodents. Loss of both quality and quantity of grain stored in such facilities must be significant.

In the absence of adequate storage on the farm, grain is piled on the ground out in the open during the harvest season. It generally remains on the ground from 3 to 5 days, where the weather may damage it. Continued wet weather during periods when a



Wheat harvesttime in the Kuban' near Krasnodar: Women in right foreground are feeding grain into a portable cleaning device. The building in the background is a typical on-the-farm grain storage facility.

large volume of grain is piled on the ground results in heavy grain losses. The absence of on-farm grain storage means that great effort is made to expedite movement of grain to central collection or storage points having more adequate storage facilities. However, during periods of heavy movement of grain from the farms to the central points, the storage space is not adequate to house all of the grain delivered. This requires piling the grain on the ground again where it is exposed to the weather until such time as storage space becomes available.

Except for on-the-farm consumption, relatively little processing of farm products is carried out in the farm villages. Instead, livestock, livestock products, fruits and

vegetables are for the most part moved directly from the farm to an assembly or processing point.

This system facilitates control over farm products, but from other standpoints, more local processing would be advantageous. It would reduce the total volume of transport because processing almost always reduces weight. Processing in farm villages could make use of labor that is available in seasons that otherwise are slack. The village pattern of living means that the labor is already centrally assembled.

Local processing, however, would require more on-farm storage. Improvement of transportation also would be needed because it usually is necessary to bring in some processing supplies.

PRICING AND PROCUREMENT OF FARM PRODUCTS

State acquisition of farm products from the collective farms in the Soviet Union has been a troublesome problem. From time to time, significant changes in the procurement system were instituted by the Government. The most recent and highly important simplification and unification of the procurement system took place during the visit of our agricultural economics group in the summer of 1958.

Prior to the latest reform, diverse methods were used by the Government to obtain farm products. First of all were the compulsory deliveries based on specific quotas per hectare of tillable or total land of the farm. A somewhat similar method was that of contracting for specific quantities of certain industrial and intensive crops, such as cotton and sugar beets. Second, extra-quota purchases were made. In recent years these purchases often exceeded compulsory deliveries. And, third, farm products were obtained as payments in kind for the work of state-operated machine-tractor stations. Prices paid by the Government were higher for the extra-quota purchases than for the compulsory deliveries. Graduated premiums or bonus prices also were paid for deliveries exceeding the specified quantities of contract crops.

In the summer of 1958 this multiple system of procurements and prices was unified into a single system of procurements with a single price for each commodity procured within a region or price zone. Although compulsory deliveries were formally abolished, quotas per unit of land

were established, and collective farms are expected to meet them under the new system. The practice of paying premium prices was discontinued. Payments in kind for the work of machine-tractor stations were eliminated with transfer of machinery to the collectives. Where the MTS are still retained, cash payments are made.

Although price stability is the general aim, some variation is permitted to cope with sharp fluctuations in output. Regional variations in procurement prices are based on cost differences and consequently will include some adjustment for yield variation.

As a consequence of the reform, there will now be only one Government procurement price in each locality for the same commodity. However, if the commodity is traded in the limited private market, the open market price may differ from the procurement price established by the state.

The prices established by the state for different farm products are designed to offer incentives for change in the direction of established goals. For example, the state intended to encourage increases in meat and milk production. But the collective farms also are expected to gear production plans into the national goals which are outlined, even though a larger income could be obtained at the established prices by some departure from the goals. In other words, prices are not considered as the sole criterion in allocation of production resources, but one step has been taken in that direction.

In the different zones, prices are set at levels that are expected to repay production costs on most farms in that zone, and to provide a residual income to members of the collective. The residual income will vary from farm to farm in accordance with production conditions and levels of management. Incidentally, elimination of MTS should facilitate advance budgeting of income, expenditures, and expected returns on collective farms.

It was not possible to determine the new Government prices actually paid for farm products in a particular region at the time of our visit. Only average prices for the country as a whole have been published, and these were given by groups of commodities. For example, one average price for all grains was published without breaking the price down by crops, such as wheat, rye,

barley, oats, corn, and millets, making comparisons difficult. But the new average of 74 rubles per center of grain indicates that the new prices are considerably higher than the old compulsory prices. For other commodities, the new prices also are higher than those formerly fixed for compulsory deliveries. As a rule, they approach or exceed the extra-quota prices.

The abolition of premium payments may diminish the incentives to increase output of such crops as cotton, sugar beets, and hemp. Regardless of the comparison of the new average level of prices with the average of the old multiple price structure, the new system has the advantage of simplicity; and both management and members of collectives have more specific price information on which to base their plans.

INCOME AND WAGES ON FARMS

Incomes on Collective Farms

Published information is inadequate to give much insight into the income and wage situation of workers in Soviet agriculture. Such data as are available indicate a significant improvement in recent years of the cash earnings of workers on collective farms, but it is difficult to derive even a rough estimate of the income available for living expenses of farm families.

The cash income data in table 11 are the official estimates of cash receipts on all collective farms, together with data on average workday units and average gross cash receipts per collective farm household.

The amount of cash distributed to the collective farmworkers is determined after deducting farm operating expenses, withholdings for the "indivisible fund," and income taxes paid to the state. The only data available on such a breakdown were contained in Prime Minister Krushchev's speech of January 22, 1958, for the years 1952 and 1956 (table 12).

The data for 1952 and 1956 indicate both a very considerable increase in total cash receipts of collective farms and of cash disbursements to collective farmworkers. The increase from 12.4 billion rubles of cash disbursement to members in 1952 to 42.2 billion rubles in 1956 came partly from the more than doubling of total cash

TABLE 11.--Total gross collective farm cash incomes, and related data, Soviet Union, selected years¹

Year	Total collective farm cash income	Average workday units per collective farmer	Average gross cash income per household
	<i>Million rubles</i>	<i>Number</i>	<i>Rubles</i>
1932.....	4,600	118	311
1940.....	20,700	254	1,107
1945.....	20,600	250	1,144
1952.....	42,800	² 295	² 2,154
1956.....	94,600	331	4,763

¹ Source: "40 Years of Soviet Power," pp. 152 and 153, Moscow, 1958.

² For 1953.

TABLE 12.--Use made of total cash receipts on collective farms, Soviet Union, 1952 and 1956

Item	1952		1956	
	<i>Billion rubles</i>	<i>Percent</i>	<i>Billion rubles</i>	<i>Percent</i>
Total gross cash income of collective farms.....	42.8	100	94.6	100
Withholdings for "indivisible fund".....	7.4	17	16.7	17
Distribution to collective farm members.....	12.4	29	42.2	45
Amount for farm operating expenses and state income taxes ¹	23.0	54	35.7	38

¹Obtained by subtracting the two previous items from gross cash income.

receipts and partly from an increase in the percentage of cash receipts distributed to members--from 29 percent of the total in 1952 to 45 percent in 1956. Expenditures for cash operating expenses and income tax payments in the aggregate increased more moderately, with a resulting significant decrease in the percentage--from 54 in 1952 to 38 in 1956--of total cash receipts required for these purposes.

The average cash disbursement per work-day unit in 1956 was 3.80 rubles as compared with 1.40 rubles in 1952. Cash disbursements per household in 1956 would be about 2,100 rubles, as compared with 620 to 625 rubles in 1952. These data signify considerable progress in the income position of collective farms and their peasant members.

The average cash disbursement per work-day unit and per worker and household on the five collective farms visited where we obtained such data for 1957 were considerably above these estimates of Union-wide averages for 1956. For instance, cash disbursements per workday unit ranged from 7 to 17 rubles on the 5 farms, as compared with 3.8 rubles for the Union average. Total cash disbursements per worker ranged from 3,325 to 4,230 rubles for four of these farms and was 5,850 rubles on an above-average cotton farm, admittedly the most profitable of all the types of farms in the country. Total production was higher in 1956 than in 1957, so it is unlikely that 1957 was a more favorable income year than 1956.

In addition to cash disbursements, the collective farmworkers receive varying amounts of payments in kind. These are used mainly by the family to supplement food production from the individual plot of

1/2 to 2-1/2 acres assigned for the use of each household.

The value of farm products from the household allotment and from payments in kind may well exceed the value of cash payments received from the collective farm, as claimed by official sources, but much of this is consumed directly by the farm family. Some of the products produced on the individual plots or received as payments in kind for work done on the collective farm operations, however, are sold for cash on the free, so-called kolkhoz market. Such sales in the aggregate were quite large considering that the total volume of kolkhoz trade in 1956 was reported as exceeding 40 billion rubles and that only 8 percent of these sales were made by collective farms as such. The rest were private sales, predominantly by kolkhoz peasants. The possibility of participation in the kolkhoz trade and benefits thereof are undoubtedly unequally distributed among the collective farms. These opportunities to a very large extent depend on the accessibility of the urban centers and availability of transportation facilities. Also, other cash receipts are obtained from the so-called commission sales through cooperatives, purchase of livestock by collectives, and other sources.

From the fragmentary information available to us, we assume an average cash income per household from all sources of 3,500 rubles in 1956 and 1957. This would be two-thirds higher than the 2,100 rubles distributed by the collective farms. Obviously, there are wide variations in earnings within the same collective farm, among the same types of farms in an area, and among regions.

Appraisal of the adequacy of this cash income involves considerations of the purchasing power of the ruble, the availability of consumer goods, the social services provided by the state, and the level of wants and desires of the people themselves. As most food needs of the family are met by production on the household allotments and by payments in kind for work on the collective, probably little cash needs to be spent for food in most cases. The 3,500 rubles of annual income per household means \$350 at the tourist exchange rate of 10 rubles per dollar.¹⁹ At this exchange rate, prices of most staple foods probably would be less than in the United States. Clothing and other manufactured consumer goods would be even more expensive. Clothing prices in the state stores appear to be about double the price of comparable quality clothing in the United States at this exchange rate. Bicycles, which are becoming quite common even in rural areas, cost from 600 to 700 rubles, or 2 months' cash income of the average collective farm family or household.

Obviously, such incomes cannot provide high levels of living even when all medical, education, and other social services are provided without direct cost to the worker. But the level of income has been rising in recent years, and hope is buttressed by the actions taken by the Soviet Government during the last year in abolishing the machine-tractor stations and instituting the new pricing scheme.

Other developments that strengthen further the cash payment part of the collective farm members' income include: (1) The increasing use of prepayments to workers on a monthly or quarterly basis of a part of the annual cash income disbursements to workers. The final amount is not known until the year-end accounting and distribution of receipts are completed. (2) A tendency toward making a greater part of the disbursement in cash and a decreasing amount of payments in kind. These developments were mentioned on several collective farms that were visited.

Wages on State Farms

State farms were frequently referred to as "the highest form of socialist organiza-

¹⁹ It is recognized that the tourist rate of exchange is only a rough indicator of comparative purchasing power, but our observations indicated that this rate actually may overvalue the ruble for the purchase of most goods used by the farm family.

tion of agriculture."²⁰ Workers on these farms are direct employees of the state, and as such are designated as "workers" rather than as "peasants" in Soviet terminology.

Soviet officials reported that wages on state farms were comparable with wages in industry. Like industrial workers, they are entitled to social services such as medical care, education, paid vacations, and subsidized housing. On the State farms that the exchange group visited, the farm-workers' dwellings frequently were newer and of better quality construction than the generally self-constructed homes of the collective farm families. Rentals were only 15 to 20 rubles per month, a nominal 2 to 3 percent of the worker's monthly wage. On some farms, no rent was charged. Each worker-household on a state farm is provided with a garden allotment similar to that allocated to a member of the collective farm.

No general statistics are available on wage rates, but data obtained on six state farms provide some information on the farm-wage structure on state farms. Wages paid per month to milkers or dairy workers on three widely separated state farms were 595 rubles, 700 rubles, and 840 rubles. Wages for tractor drivers on a state farm north of the Caucasus were 800 rubles per month, and on a cotton farm in the Uzbek S.S.R. were 1,000 rubles per month. Average wages for all workers on a poultry farm near Leningrad were 637 rubles per month; and on another poultry farm near Sochi on the Black Sea, they ranged from 750 to 900 rubles per month. Among the higher wage rates were those of tractor-brigade leaders on a cotton farm, who received 1,200 rubles per month, and sow attendants on a large hog farm in the Kuban' region, who were paid 1,057 rubles per month.

The statement was frequently made that "of course" these monthly wage rates were paid the year round, including 1 month of vacation with pay. On the other hand, we were occasionally told that the earnings were on a piece-rate basis. When we were given annual-earnings figures, they seemed to be about 12 times the monthly wage rates.

On the supposition that the monthly rates apply the year round, annual earnings of workers on state farms would appear to be about 6,000 rubles for general farmworkers

²⁰ See "40 Years of Soviet Power," p. 145. Moscow, 1958.

and up to 15,000 rubles for tractor-brigade leaders. Frequent mention was made of bonus payments above the basic rates for extra performance, but no information was obtained as to the amount and extent of such bonus payments. An illustration was given on a cotton farm near Tashkent in which 60 percent of the savings below a budgeted figure of so many thousand rubles for producing cotton on 40 hectares of land were distributed to the members of the brigade, provided the yield goal was met. Such bonuses add to the workers' incomes and, at the same time, provide incentives for efficient operations and greater production.

The conclusion seems warranted that, in general, workers doing similar types of work on state farms receive higher cash incomes than do the average peasant workers on collective farms. There is a wide range in the residual incomes available to members of collective farms. But with such income differentials and with wages on state farms being about the same as in industry, it is easily understandable that labor turnover on state farms is low, as stated by one director of a state farm.

Other Wage Data

The spread in incomes between the lowest and highest is wide in the Soviet Union, and is perhaps becoming wider with the passage of time. In this respect, the economy of the Soviet Union departs widely from the general notion that all workers in a communistic society receive about the same incomes.

No income-distribution data are available, but the exchange group obtained samples of information that indicate the nature of income differentials. A director of a research institute receives a salary of 75,000 rubles per annum if he has a Ph. D. degree, and 55,000 to 65,000 rubles if he is a Ph. D. candidate. We were told that chair-

men of most collective farms receive a credit of 1,700 workday units per year on which they receive the regular cash disbursement per workday unit at the end of the year. The average worker earns about 330 workday units. If the income of the farm is over 1.4 million rubles, the chairman receives a bonus of 400 rubles per month. The chairman of a large collective farm that we visited reportedly received about 70,000 rubles per year. The annual salary of a high official in the territorial organization for agriculture was reported as 36,000 rubles.

Professional and scientific workers occupy intermediate positions in the income range. On one agricultural experiment station which was a part of a state farm operation, we were given the following salary figures:

Scientist rating:

	Rubles--	
	Per month	Per year
Senior scientists,		
Ph. D. candidates...	2,200	26,400
Junior scientists,		
with advanced de-		
grees.....	1,700	20,400
Scientists without		
degrees.....	980	11,760

Scientists without degrees received about the same incomes as tractor drivers. These are probably what we would term "sub-professional" scientific assistants.

These data, inadequate as they are, indicate that the Soviet system provides economic incentives through the salary system for the individual to strive for improvement, with some expectation that with proper qualification, hard work, and the right opportunity, he can materially improve his economic status.

LIVING CONDITIONS IN THE FARM VILLAGES

As already indicated, the village pattern of rural living antedates the Communist Revolution. Combination of land tracts into state and collective farms was facilitated by the predominance of village settlement. Usually two or more villages are included within the boundaries of one collective or state farm. The number of households on the farms that we visited ranged from 170 to 2,000 households.

The smaller villages are built in "string-town" fashion, with houses on both sides of the street and the individual household plots of land commonly extending back of each house. Cows and other individually owned livestock usually are sheltered adjacent to the house.

Village life provides opportunity for group contacts and accessibility to the available community services. These are important

considerations, because the families on collective and state farms usually have no private means of transportation.

Public expenditures for physical improvement of the villages apparently are

kept at a minimum. The village streets are not surfaced except for the main street in some of the larger villages. Consequently, many streets become seas of mud after a rain. Water usually is



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Street scene in a farm village near Novosibirsk, Siberia.

obtained from surface wells serving more than one family. No sewage facilities are provided. Although 56 percent of the collective farms were reported as having access to either mobile or central electric power, only 34 percent actually had electricity available for general use in 1956.

The level of living of farm families has its origin in the following sources:

(1) Cash income distributed to workers on the collective farm or the wages paid out by the state farm.

(2) Food supplies for home and for sale that can be produced on the household plots and the payments in kind from the collectives.

(3) Housing. Houses are frequently provided on state farms, and liberal loans are made for home building on collective farms.

(4) Public and community services provided by the state (or by the collective). These include education, health, and old-age and disability pensions.

Cash Income

About 40 percent of the collective farms now make monthly cash advances, and 30 percent make quarterly advances to individual workers. The cash income available per household to the average family on collective farms was previously estimated

at about 3,500 rubles annually. At the tourist rate of 10 rubles per dollar, this would be equivalent to \$350 in American terms.²¹ It should be recalled that this family income is usually the result of farm-work contributed by both husband and wife. But in addition, the family has a house to live in, the food produced on the household allotment for use in the home, and the medical and social services provided by the state or by the collective.

The purchasing power of the cash income is limited by the high prices and scarcity of consumer goods. Also the Government admonishes the workers to save part of their income and to invest it in Government savings bonds. Originally, capital formation in the Soviet Union resulted largely from the margin obtained by procurement of farm products at low prices and their sale at high prices; also from high prices and limited availability of other consumer goods. For example, a pair of men's shoes

sells for 200 to 250 rubles, or most of the cash income of the family for a month. The price of a man's ordinary suit would range from 800 to 900 rubles, or all of the cash income for 3 months.

Household Allotments and Payments in Kind

As previously mentioned, each family is allotted from 1/2 to 2-1/2 acres of land for the production of food crops and livestock for home use. Local sale of the surplus above home needs is permitted. An estimate of the income from such sales is included in the cash income. The garden produce, the cow, the pig, and the poultry (plus the payments in kind of wheat or rye, sunflowers, potatoes, and some feed for the individually owned livestock from the collective farm) provide most of the food supply for the collective farm family. Workers on state farms also have individual household plots of land for the home food supply, but they receive cash wages and get no payments in kind.

²¹See footnote 16 on purchasing power of the ruble.



Markets similar to this community market in Tashkent, Uzbek S. S. R., are common throughout the Soviet Union. Such markets provide a means of marketing farm produce beyond the state quotas as well as products of individual plots.

The household allotments and payments in kind enable farm families to be largely self-sufficient with respect to their food supplies, except in areas where cotton or highly intensive industrial crops are grown. It is necessary to buy such items as tea and spices, but there is probably very little cash outlay for food. It should be recognized, however, that care of the gardens and the individually owned livestock

are time-consuming hand-labor operations. They are the very opposite of the large-scale mechanized operations performed on the land operated as collective and state farms.

Housing

The typical peasant house in the Steppe, or prairie, areas is built of adobe brick.



Mud-walled thatch-roofed house on the Steppes of Kazakhstan, near Akmolinsk.

The outside wall is usually plastered and often whitewashed. The roof is frequently of thatched straw or rushes. Sometimes in the older houses the single-sash windows are placed in the wall without frames. Consequently, there is no opportunity for window ventilation. The house is usually a 1-story building with 350 to 400 square feet of floor space, which would provide 80 to 100 square feet per person for the average family. The house is usually divided into either 3 or 4 rooms.

In the wooded areas, many of the village houses are built of logs, but some are built with sawed lumber. Both types are substantial structures. The houses seem to be of similar size and design regardless of construction material, except in the Uzbek

S.S.R. and other southern regions where the older mudwall houses are of Asiatic type. In the northern forested areas, wood is available for fuel as well as for building construction, but in the Steppe areas, cow dung mixed with straw apparently is the principal source of fuel.

Despite considerable variation in incomes of different types of workers on collective and state farms, the houses in farm villages have an appearance of sameness, both in size and architecture. Even the chairmen of the collective farms or the managers of the state farms live in homes that are very modest by American standards. These officials receive much higher incomes than the average farmworker. Therefore, one would expect that a part of the increase



This peasant home in the Kuban' area is built of adobe brick with a thatched roof; the walls are mud plastered and whitewashed.

would be spent on housing. Their homes are somewhat more commodious, but still quite modest. Perhaps the peasant background of the higher farm officials has tended to set the standard of housing. There is also the question of scarcity of goods to build and furnish a larger home more adequately.

On the collective farms the houses are individually owned. Loans are made on liberal terms for house construction. On state farms the houses are both state owned and individually owned. The state-owned houses are furnished at a very nominal rental. On one of the state farms visited by the exchange group the workers were allowed housing that averaged 75 to 80 square feet per person in the family at a rental of 20 to 25 rubles per month. This would be somewhat less floor space

per person than would be available in the usual house on a collective farm. Generally, however, the housing furnished to the workers on state farms seemed to be somewhat roomier and better than the individually owned houses on the collective farms.

Home Environment

Because women participate in the work on collective and state farms, and also in the care of individual livestock and the garden allotments, they probably have very little time available for homemaking in the American sense. Women workers on collectives are entitled to a month's leave before and a month's leave after childbirth. This time is credited at half the average number of workday units earned



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These log houses are in a farm village near Novosibirsk, Siberia.

by the worker granted such leave. The required minimum number of workday units for participation in the collective also is reduced for women with small children.

Young children frequently are cared for in day nurseries until they are of school age. When they are old enough to go to school, they attend classes 6 days a week. Children and youth belong to party organizations that take the place of 4-H Clubs in this country.

Recreation

The village community usually develops a number of recreational activities. The more prosperous farm villages have a "house of culture," or a community center, paid for out of the general fund on collective farms and from state funds on the state farms. This building is an im-

portant gathering place for the people of the village. Movies are provided and home talent productions of various kinds are put on by the village community. One such home talent production was presented for the benefit of the visiting Americans. It consisted of a Cossack band in full dress, a mixed choir, several vocal solos, and dances by men and women in native costumes. It was an excellent performance. On Sundays we saw trucks loaded with farm people headed for some recreational activity. This may have been fishing, berry picking, or taking advantage of recreational facilities available in the larger towns. The trucks owned by the collective or state farms are made available for these Sunday activities.

Workers on state farms get paid vacation, and somewhat similar arrangements are made on the collective farms that we



This log house is under construction on a collective farm near Leningrad.

visited. As special incentives to workers, some grants for outstanding performance are made for vacations at resorts, trips to Moscow, and other large cities. The Moscow trips usually include a visit to the Agricultural Exhibition.

Health Services

Medical and hospital services are supplied free of charge by the state to the entire population. Doctors and hospitals were available for all the collective and state farms that we visited. Sometimes medical facilities were available in each village included in the farm.

Old-Age and Disability Pensions

Workers on state farms share in the state pension system the same as industrial and other wage workers. Old-age pensions range from 50 to 100 percent of earnings, depending on length of service and the type of dependents. Men are en-

titled to old-age pensions at age 60, and women at age 55, but many continue work beyond these ages. Disability pensions also are provided.

Members of collective farms are not included under the state pension system. Old-age and disability pensions, however, are provided by setting aside a part of the gross income of the collective. Mention was made of 2 percent of the gross income allocated to the pension fund. Under such arrangements the pension payments would vary among the different collectives, in accordance with the earnings of the collectives and the fund set aside for this purpose. On many collective farms, the pensions would be below the level for workers on state farms.

Education

The Soviet Government has placed emphasis on providing basic education for the entire population. Schools are available to all farm children. Seven years of education are compulsory. In the summer of

1958 there was some discussion about 10 years of compulsory education, but recent developments indicate a continuation of the 7-year compulsory school program, but to be followed with vocational experience. An exception will be made for the gifted children, for whom a 10-year course preparatory for college education is provided.

Because schools in the Soviet Union hold classes 6 days a week for about the same length of school year as in the United States, the approximate equivalent of 12 years of U. S. education is completed in 10 years. However, children start their schooling at age 7 in the Soviet Union, so that ages at completion are not much different.

Schools in farm villages fall into three categories: Primary, or 4-year schools; incomplete secondary, or 7-year schools; and complete secondary, or 10-year schools. As a 7-year school includes all 7 grades and a 10-year school all 10 grades, as a rule, no separate secondary schools are established in the Soviet Union similar to those in the United States. We did not have an opportunity to visit any school that was in session, because of summer vacations.

Almost every village provides primary schooling, in a separate primary school or as a part of one of the two types of secondary schools. Many have 7-year schooling, again either in a 7-year school or as a part of a 10-year school.

Children in villages lacking a school facility above either the 4th or 7th grade will attend school in a nearby village. Three arrangements were noted. The pupil may go to and from that village daily, either by walking or by bus; he may live with relatives in the village; or he may board at the school. When boarding arrangements are necessary, they become a handicap to successful completion of secondary schooling.

Nevertheless, it is reported that a very high proportion of 7th-grade graduates complete 10 years of school, in either a 10th-grade school or an equivalent vocational or technical school. At the Agronomist State Farm near Krasnodar, for instance, 80 percent of 7th-grade graduates were reported as completing the 10th grade or its equivalent. At the Fifth Anniversary of Uzbek State Farm, Tashkent, 93 to 95 percent of all graduates of the 7th grade were reported as completing the equivalent of 10 grades.

Many farm youth get other education of some form. The system is complex. A major opportunity is found in the various forms of vocational schools. Some vocational training may begin as early as the 8th grade. The more technical vocational training begins after the 10th grade. Farm people often classify their opportunities as:

- Lower, vocational -- About 7 months of training;
- Middle, vocational²² -- 4 to 5 years if it begins after the 7th grade;
- Higher, agricultural -- Equivalent to a institute U. S. university, and leads to a diploma.

Practical experience is stressed as a prerequisite for many vocational courses. Usually 2 years are required, although this doubtlessly varies according to the extent of vocational training applied for.

In addition, semiprofessional schools, or "technicums," provide opportunities for advancement. Furthermore, rural youth avail themselves of correspondence courses, on-the-job training, and similar forms of adult education.

Higher education in institutes, academies, and universities is available to youth, including farm youth, who qualify for admission. Stiff entrance examinations must be passed. A number of agricultural curricula are available in these institutions. In the Ukraine, institutions for higher education in agricultural sciences have recently been joined with agricultural experiment stations in much the same manner as is common in the United States. A recent pronouncement called for 2 years of "practical work experience" as a prerequisite for higher education.

An indication of high interest in education past the 10th grade is the report from the Agronomist State Farm that 70 percent of 10th-year graduates there enroll for some further education. Doubtless, a large part is vocational education, including correspondence courses.

The Soviet Union has no exact equivalent of the adult education program that is provided by the Extension Service in the United States. It should be recalled, however, that technical specialists in different

²² There are about 800 agricultural technical schools, middle class, in the Soviet Union.

fields of agriculture are attached directly to the collective and state farms, where they participate in both the planning and supervising of operations. Books and farm papers are published by the state, but posters resembling our commercial billboards are probably the most common means of conveying agricultural informa-

tion to farm people. This is especially true of information needed to achieve production targets.

Special mention should be made of the educational use of the permanent All Union Agricultural and Industrial Exhibition at Moscow, and the Ukraine Agricultural Exhibition at Kiev. The All Union exhibition



N-29267

Fat-tailed sheep from south-central Asia are on display at the All-Union Agricultural and Industrial Exhibition in Moscow.

in Moscow has a special building for each of the Republics in the U.S.S.R., where the agricultural and industrial accomplishments of that region are portrayed. Special exhibits of crops and processed farm products are on display. The best representatives of the improved breeds of the different kinds of livestock are kept in special quarters, and show ring performances are arranged. Demonstration plots of improved varieties of crops are maintained at the exhibition; also a complete line of the newest farm machinery.

The exhibition grounds were first developed for agricultural exhibits, but industrial sections have been added in recent

years. The agricultural exhibition at Moscow is several times the size of the larger State fairs in the United States. It is open at all times, except during the 4 winter months. All the exhibits are prepared and kept up to date by the state. There is a constant stream of visitors from all parts of the Union. A free trip to the Exhibition is undoubtedly cherished by those who receive it as reward for exceptional accomplishment.

The agricultural exhibition at Kiev serves a similar purpose for the Ukraine S.S.R. It has the added advantage of being located adjacent to the agricultural college, and therefore also serves as a laboratory for



N-29269

Left to right: John W. Kirkbride, Carl P. Heisig, Sherman Johnson, Harold Breimyer, and Lazar Volin, members of the U. S. agricultural economists exchange group, and G. G. Kotov and Oleg K. Nichiparouk, U. S. S. R., examine wheat in a demonstration plot at the All-Union Agricultural and Industrial Exhibition at Moscow.



N-29258

Delegation of U. S. agricultural economists viewing the farm machinery display at the All-Union Agricultural and Industrial Exhibition at Moscow.

college students. The exhibitions are constructed on a lavish scale to impress the visitors with substantial progress in all fields of agriculture. The visits may also serve as spurs to greater effort and better performance in achieving production targets on the farms to which Soviet visitors are attached.

Improvement in Living Conditions

A description of living conditions in the farm villages would not be complete without mention of the evidences of gradual improvement. Most farm families in the Soviet Union probably have little knowledge of how farm people live in other lands. They do know that they are living about as well as their neighbors in the same village, al-

though the income varies on different collective farms. They also know that both they and their neighbors are living somewhat better now than in former years. Certainly there is no shortage of food of the kinds to which they are accustomed, although the diet is heavily weighted by cereals and potatoes. The new houses that are being built are not commodious, but they are somewhat better than the old. The recent increases in income provide for a few extras such as bicycles. The children go to school, and health services are provided without cost. The recent improvements in the material content of living probably promote hope for gradual betterment in the years to come, and that expectation provides motivation for achievement of greater production.



General view of the central plaza of the All-Union Agricultural and Industrial Exhibition, Moscow, U. S. S. R.

CONCLUSIONS

1. Agriculture today cannot be considered the "Achilles heel" of the Soviet economy. There have been periods when the Soviet Union was encountering serious difficulty in meeting essential food needs, but it is now capable of producing food enough for its own population, at least at present dietary levels. In fact, it may have sizable exportable surpluses of grain in some years. The Russian people are accustomed to a high cereal and potato diet. Their present per capita meat consumption is probably not much more than one-third the per capita consumption in the United States. But the Soviet Union is striving hard to increase production of meat and milk, as well as of fruits and vegetables, in order to improve the diets of a growing urban population. The national diet has improved gradually in recent years and it is expected to improve further. Increases in meat production, however, are likely to be retarded by limited feed supplies.

2. Climatic factors tend to limit the potentialities of agriculture in the Soviet Union. Most of the fertile Chernozem and Chestnut soils are located in areas of low

and variable precipitation. Growing conditions on these soils, therefore, are more comparable to our subhumid Great Plains region than to the Corn Belt. The less fertile podzolic soils in the northern wooded areas have the handicap of a short growing season and frost hazards. Recurrence of severe droughts and other unfavorable weather influences will result in short crops in some years. Large carryovers of foodstuffs, therefore, are required to provide for such contingencies.

3. The 90 million acres of new land that was developed from 1953 to 1957 apparently included most of the readily accessible area that is suitable for crops and that could be made available without the expense of clearing, drainage, or irrigation. The current 1959-65 plan does not call for large-scale new-land programs, although it does include expansion of irrigation in the cotton areas and in southern Ukraine. The present irrigated area of about 28 million acres is nearly equal to the area of irrigated land in the United States.

Over a longer period, much clearing and drainage could be undertaken in the north-

ern wooded areas. Soviet officials estimate that about 60 million acres could be developed in the European area. Additional lands also could be developed in Asia at a later time.

4. Russian agricultural leaders recognize that their greatest opportunity for expanding output involves the use of more commercial fertilizer and other improved practices in order to increase yield per acre. More fertilizer will greatly increase yields of all crops, especially in the podzolic soil areas. However, its use in the extensive subhumid zone may be less effective. Although use of commercial fertilizer has tripled since 1940, the present level is only about 40 percent of the quantity used in the United States. Plans are under way to produce much more fertilizer, and a rapid increase in use can be expected.

5. It also seems likely that farm output could be increased by greater attention to regional specialization, a subject that is now under discussion in Soviet agricultural circles. For example, the northern podzolic areas are best suited to forage and livestock production. If more of the emphasis on increases in milk and poultry production were centered in these areas, specialization in grain production could be continued in the more productive soil areas. Progress in regional specialization of this type, however, is dependent upon improvement of transportation facilities. Agriculture is seriously handicapped by inadequate roads.

6. Progress in mechanization of crop production is most striking in operations that lend themselves to use of heavy duty equipment such as plowing and harvesting. Large-scale machines made possible the vast program of new-land development. Mechanization also has aided output expansion in the older farming areas. So far, however, the various steps in mechanized farming are not fully integrated. For example, although wheat production is mechanized through harvesting, the provisions for mechanized cleaning, drying, and storage of grain are inadequate. Some new planting and harvesting machines have been developed and are on display at the agricultural exhibitions. The new models of tractors and combines represent considerable improvement over those now commonly in use.

7. Rapid expansion of livestock production has necessitated building many new dairy barns and hog and poultry houses. Milking machines and feed and litter carriers have been installed on many farms.

It appears, however, that construction cost and labor economy have not been given adequate consideration in building design and location. For example, silos often are located some distance from the barn.

Increased emphasis on livestock also has created problems of feed supply. Natural conditions lend themselves better to production of small grains than of corn or forage. So far, heavy reliance has been placed on a number of forage crops that are cut green for feeding. In the south some areas are double-cropped. The system is laborious and less satisfactory than high-yielding production of feed grains would be.

8. Fragmentary evidence suggests that farm output per worker is only about one-fourth as high as in the United States. The emphasis on investment of capital in heavy industry rather than in agriculture, together with the ample labor supplies in the farm villages, probably has resulted in giving priority in mechanization to the most burdensome, and the highest power-consuming farm operations. Both men and women workers are then assigned to perform the remaining operations with hand labor until capital is available for more complete mechanization.

9. It should be possible to carry out the production job in agriculture with a much smaller number of workers. Rapid progress in this direction, however, may require further mechanization, reorganization of work programs, and more incentives for individual performance.

10. It is difficult to appraise the advantages and disadvantages of large-scale farming as practiced on the huge collective and state-operated farms. In the United States few advantages can be attributed to farm size larger than a unit which can utilize efficiently the modern machinery and other improved practices that are adapted to the type of farming. A capable manager may obtain a larger management return by handling two or more such units, but at some stage even capable management is spread too thin to offset the disadvantage of supervising operations spread over a large geographic area. In Soviet farming, several villages are combined into one collective or state farm. This necessitates establishment of subunits, with brigade leaders in immediate charge of operations at each subunit headquarters. Even the subunits are so large that much time is consumed in going to and from work.

The large-scale farms do fit into a pattern of centralized planning and supervision

of agriculture. With only about 82,400 farm units in the entire country, information on plans and performance can move readily from the farms through the different units of government to the all-union officials. Similarly, the central planning instructions are readily disseminated through the same channels back to the limited number of management units. Agronomists, veterinarians, engineers, and other specialists are attached to the central headquarters of each farm as a part of the administrative staff. They supervise adoption of the new practices that seem to promise more output or higher efficiency.

11. Central planning and supervision of agriculture, although less centralized than in earlier years, permit the marshalling of all available resources to achieve a specific goal. Large-scale efforts of this type can achieve such startling results as the 90-million-acre new-lands program. They can also produce costly mistakes. And some steps have been taken without regard to economy and efficiency in the American sense. Recent changes in farm programs, however, seem to give increasing emphasis to cost reduction, economy of operation, and greater incentives for individual effort in both work performance and management. Research on economic problems of production has been greatly expanded in recent years.

12. The Soviet Union has potentialities for increasing both farm output and production efficiency if the authorities decide to do it. The methods used will be vastly different from ours, but past experience indicates that progress should be expected.

At the present time production efficiency, especially labor efficiency, is low by Ameri-

can standards. The system of collective and state-operated farms is not likely to provide production incentives for farm people that are equal to the incentives on family farms in this country. In other words, it may be difficult to substitute for the "magic of ownership which turns sand into gold." Also, the struggles incidental to establishment of collective farming may have left scars that will impede development of adequate production incentives.

Some of the recent changes in agricultural policy, however, do provide greater production incentives. Abolition of the machine-tractor stations and transfer of machinery to the collective farms are steps in that direction, which, together with the new price policies, should return greater income to collective farms. The bonus system of remuneration that has been in effect for some time is intended to reward extra effort. The state has trained cadres of managers and crop and livestock specialists who are responsible for introducing new techniques and for supervising farming operations. About 450,000 agricultural specialists "with a higher or secondary professional education" were reported in 1956.

The continuous pressure for achievement of ever higher goals is comparable to our wartime goals effort. Accomplishments are publicized through placards and other media. The agricultural exhibitions at Moscow and Kiev serve both as educational exhibits and as spurs to greater effort.

Farm people have shared to some extent in the benefits from recent increases in output. And how rapidly farm output and production efficiency will increase in the future may depend upon the incentives for greater effort that are provided for the rank and file of farm people.

APPENDIX

EXAMPLES OF COLLECTIVE AND STATE FARMS

The agricultural economics research group visited 16 collective and state farms during its stay in the Soviet Union. These farms were located in nine different regions. The listing of these farms by regions is followed with case descriptions of two collective farms and one state farm.

Krasnodar Region (northern Caucasus)

1. Kalinin Collective Farm, north of city of Krasnodar, 9,230 hectares (22,807 acres) of cropland, about 4,400 cattle and 6,000 hogs.
2. Red Star Collective Farm, northeast of city of Krasnodar, 12,787 hectares (31,597 acres) of cropland, about 5,600 cattle and 9,000 hogs.
3. Kubanyetz State Farm, north of city of Krasnodar, 5,753 hectares (14,216 acres) of cropland, about 1,000 cattle and 10,000 hogs.
4. Agronomist State Farm, northeast of city of Krasnodar, 2,500 hectares (6,177 acres) of cropland, orchards the main enterprise; about 1,500 cattle and 1,500 hogs.

Southern Caucasus Region

5. State Poultry Farm, at town of Adler, south of Sochi on Black Sea coast, 70 hectares (173 acres) of land with about 100,000 laying hens plus 180,000 other poultry.

Rostov Region

6. Lenin Collective Farm, 10 km. (6.2 miles) west of Taganrog, near Sea of Azov, 6,000 hectares (14,826 acres) of cropland, about 2,900 cattle, 3,500 hogs, and 120,000 poultry.

Kiev Region, Ukraine

7. Friendship Collective Farm, 25 km. (15.5 miles) northwest of Kiev, 1,250 hectares (3,089 acres) of cropland, about 900 cattle, and 500 hogs.
8. State Farm and Animal Husbandry Experiment Station, 60 km. (37.2 miles) southwest of Kiev, 2,147 hectares (5,305 acres) of cropland, about 700 cattle and 1,200 hogs.

Crimea Peninsula, Ukraine

9. Friendship of Peoples Collective Farm, 70 km. (43.5 miles) north of Simferopol, 6,000 hectares (14,826 acres) of cropland, 1,100 acres in irrigated orchard, vineyard, and truck crops, about 3,300 cattle, and 5,000 hogs.

Tashkent Region, Uzbekistan

10. Stalin Collective Farm, about 10 km. (6.2 miles) northeast of Tashkent, 1,071 hectares (2,646 acres) of irrigated cropland (mostly cotton), about 1,000 cattle, and 300 hogs.
11. Fifth Anniversary of Uzbekistan State Farm, 45 km. (28 miles) southwest of Tashkent, 5,320 hectares (13,146 acres) of irrigated cropland (mostly cotton), about 300 cattle, and 1,000 hogs.

Akmolinsk Region, northeastern Kazakhstan

12. Victory Collective Farm, 80 km. (49.7 miles) west of Akmolinsk, 29,006 hectares (71,674 acres) of cropland, about 4,200 cattle, 1,500 hogs, and 6,500 sheep.
13. State Farm and Scientific Research Institute for Grain Crops, about 80 km. northwest of Akmolinsk, 11,000 hectares (27,181 acres) of cropland.

Novosibirsk Region, western Siberia

14. Lenin Collective Farm, 20 km. (12.4 miles) south of Novosibirsk, 5,500 hectares (13,591 acres) of cropland, about 1,500 cattle, and 1,200 hogs.

Leningrad Region

15. Eighteenth Congress of Communist Party Collective Farm, 50 km. (31 miles) southwest of Leningrad, 600 hectares (1,483 acres) of cropland, producing vegetables for Leningrad market, about 600 cattle, and 600 hogs.
16. Bolshevik State Farm, 32 km. (18.9 miles) west of Leningrad, 920 hectares (2,273 acres) of cropland, about 150,000 poultry, and 800 cattle.

Because of the vast distances covered and the time required for consultation with All Union, Republic and local agricultural authorities and for the visits to research centers, only a limited number of farms could be visited. And the time available for a farm visit was always too short to obtain a detailed picture of the huge operations under way on each farm. Nevertheless, the farms visited provided an opportunity to get a first-hand look at actual

farms. We recognize that the 16 farms are only a few case studies of different types of farms in widely separated areas. But in terms of cropland area, the case studies probably would represent the equivalent of 800 to 1,000 farms in the United States.

In order to provide more information on the general organization and operation of collective and state farms in the Soviet Union, three of these case farms are described below in some detail.

ILLUSTRATION 1--RED STAR COLLECTIVE FARM NEAR KRASNODAR

This is a combination grain-livestock farm located in the heart of the Kuban', or northern Caucasus, one of the best agricultural areas of the Soviet Union, and frequently referred to as the "Corn Belt of the Soviet Union." The soil is deep Chernozem. The annual precipitation averages 25.6 inches, which is generally adequate and fairly dependable. The growing season averages 190 days.

People.--There are 1,793 households on the farm, which contain 2,542 able-bodied workers who comprise the membership of the collective farm. Of these workers, 1,471 are women, or 58 percent of the total--very near the 60-40 ratio for the Soviet Union as a whole. The people live in one large village, or "stanitza," and several smaller ones.

Each collective farm household is allotted about 1 acre of land for a garden plot and

on which to build the family house, which is usually a modest 4-room rectangular structure of adobe bricks covered with stucco, and with a thatched roof. Each family can keep 1 milk cow, 2 hogs, 2 sheep, and some poultry. The garden plot and livestock supply most of the food needs of the family; when these products are combined with the yearly disbursement in kind of wheat and some vegetables and fruit from the "communal" farming operations, the family usually has some products to sell on the open market. Disbursements in kind of farm products to workers are related to the amount of work done on the farm by the members of the family.

Land Use.--The total land area of the collective farm is 16,200 hectares (40,000 acres), of which 12,787 hectares (31,600 acres) is plowland. Table 13 gives cropland use in 1958.

TABLE 13.--Cropland use on Red Star collective farm, near Krasnodar, Krasnodar Region, U.S.S.R., 1958

Crop	Hectares	Acres
Winter wheat.....	4,252	10,500
Winter and spring barley.....	1,200	2,960
Corn for grain.....	1,200	2,960
Corn for silage.....	1,160	2,865
Sunflower.....	600	1,480
Sugar beets.....	1,075	2,655
Annual grasses.....	1,600	3,950
Perennial grasses, mainly alfalfa.....	1,700	4,190

In keeping with the drive within the Soviet Union for more milk and meat production, the acreage of sunflowers has been reduced and corn acreage increased to provide more feed for livestock.

Crop Yields.--The 1958 season was better than normal, so yield expectations were favorable. Estimates of yield of small grain are made on June 1. About 2,200 hectares of winter wheat had already been harvested when the group visited the farm on July 11,

with harvested yields slightly above the June 1 estimate. Yields for the more important crops for 1957 and expected for 1958 are given in table 14.

Livestock.--The main livestock enterprises on the collective farm were dairying and hog production. Livestock numbers in the communal herds (owned in common by the collective farm and under the management of the farm chairman and board of directors as distinguished from the individually owned livestock of households) and livestock individually owned on the household plots of collective farm members in the summer of 1958 are shown in table 15.

As in other areas of the Soviet Union, the individual households own a significant proportion of the livestock on the farm.

Milk production per cow in the communal herd was given as 2,800 kg., or 6,175 pounds. The farm chairman reported that the individually owned cows produced a like amount of milk.

The dairy cows were of the Red Steppe breed. They were housed in large gable-roof barns, each containing 260 milk cows in 4 rows. Five such dairy barns accommodated the communal dairy herd.

The cows were milked and fed in these barns the year round, being turned out for short periods each day for exercise in the bare ground barnyards. The cows were fed by "green chop" in the summer, and hay, silage, and grain in the winter. Two full-time workers per 100 cows are assigned for feeding, cleaning of manure, and hauling of feed. The cows were hand-milked, each milkmaid handling 13 or 14 cows and milking 3 times a day.

We did not have time to see the hog enterprise on this farm, but on another similarly organized collective in the same area we were shown three circular, high-roofed hog houses where 1,062 hogs were being fed. Each hog house handled 400 pigs in the winter, and 600 in the summer, when

TABLE 14.--Yields of important crops at the Red Star collective farm near Krasnodar, U.S.S.R., 1957 and 1958

Crop	Centners per hectare		Bushels per acre	
	1957	Expected in 1958	1957	Expected in 1958
Winter wheat.....	23.2	35.0	34.5	52.0
Winter barley.....	--	29.9	--	55.6
Spring barley.....	22.0	22.0	40.8	40.8
Sunflower seed.....	15.6	22.0	¹ 43.4	¹ 61.2
Corn.....	29.5	(²)	47.0	(²)

¹ At 32 lb. per bushel.

² Not given. 1956 yield of corn was 40 centners per hectare or 63.7 bushels per acre.

TABLE 15.--Livestock in commercial herds and owned individually by households, Red Star collective farm, near Krasnodar, U.S.S.R., 1958

Livestock	Communal herds	Individually owned
Cattle, all.....	4,600	--
Milk cows.....	1,360	990
Hogs.....	7,500	1,560
Sheep.....	2,310	1,800
Poultry.....	--	83,750

they could go into yards adjacent to the house. The hog-feeding operation was carried on the year round, with a permanent staff of workers assigned to the operation--again, most of the workers were women.

The live weight of slaughter hogs was reported as 90 to 100 kg. (198 to 220 pounds). The current price received by the collective farm for hogs delivered to the state procurement agency was given as 800 rubles per 100 kg. of hogs live weight (or 36¢ per pound at a 10 to 1 conversion rate).

Farm machinery.--The collective farm had recently purchased farm machinery from the nearby machine-tractor station, in line with the state policy of shifting farm machinery to the collective farms, as announced early in 1958. Principal machines on the farm were:

- 67 tractors (98 in terms of 15 drawbar horsepower units)
- 20 grain combines
- 75 tractor drills
- 70 tractor cultivators
- 6 silage or forage harvesters
- 14 sugar beet lifters

This is an impressive list of farm machinery, but it is easy to forget how large these farms are. Actually, there is an average of 461 acres of cropland and 38 workers for each of the 67 tractors.

Performance rates for plowing were given as 17.3 acres per 8-hour shift with the common-sized 54 horsepower crawler tractor, and 29.6 acres with the larger 80 horsepower tractor. Combines average 25 to 30 hectares (62 to 74 acres) per 10- to 12-hour day, according to the farm chairman. On another farm nearby, however, the figure given was 20 to 25 hectares (49 to 62 acres) for a combine with a 4-meter width of cut. These rates seem high when compared with an average of 3, and up to 4, acres per hour for 12- or 14-foot combines in the Great Plains States of the United States.

Labor Organization and Earnings.--The labor force on this farm was organized into four field brigades to handle the crop operations, and four livestock brigades to handle the dairy and hog enterprises. Each brigade has an allotment of farm machinery for which it is responsible under the direction of a brigade leader who, in effect, is a submanager of a major part of the farming operations. Each of the four field brigades would handle an average of about 3,000 hectares, or 7,458 acres of cropland.

The management of the farm is handled by an elected chairman and a management board consisting of the top four or five technicians on the farm, such as the agronomist, veterinarian, and the agricultural engineer. It was reported that the management board meets three times a month and that general meetings of the collective farm membership are held monthly. Decisions of the management board presumably are subject to approval by the general membership.

Members of the collective are required to earn a minimum number of workday units annually. If they fail to do so, they must explain the reason to the management board. They are subject to expulsion from the collective if their reasons are unacceptable. The minimum number of workday units per year required is 350 for men and 250 for women, except that women with children who cannot work regularly may have a minimum requirement as low as 100 workday units.

Workday units are established by each collective farm on the basis of certain minimum standards of performance. A diligent worker can easily earn more than 1 unit per day. For instance, on the Red Star collective farm, milkers earned up to 3 workday units per day. The annual average for men workers in 1957 was 475 workday units for this farm.

Farm Income.--Total cash sales for the Red Star farm in 1957 were 14.7 million rubles, of which about half were from crop sales and half from sales of livestock and livestock products. Because of changes in the pricing scheme in 1958, cash sales on the same volume would be higher than in 1957. The chairman estimated that wheat would bring 2 million more, and that all farm sales would total 4 million rubles more in 1958 than in 1957. However, the cost of owning and operating the machinery will henceforth fall directly on the collective farm, and may offset much of this increase in income.

From 18 to 20 percent of the sales are set aside in an "indivisible" fund that is used for capital investment--for purchase of farm machinery, construction of farm buildings, and similar improvements. An income tax is paid to the State at the rate of 13 percent of net income. From information obtained elsewhere, this farm will probably pay between 1 and 1.5 million rubles as income tax.

After deductions from gross sales for farm production expenditures, state income taxes, and the indivisible fund allocation,

the net is distributed to the individual collective farm members on the basis of workday units earned. No information on disbursements to members was obtained on this farm, but on another farm in the area of similar size and type, disbursements in 1957 per workday unit were 7 rubles in cash, 2 kg. of wheat, 300 grams of sunflower seed, 2 kg. of vegetables, and

1.5 kg. of fodder. If a man earned 475 workday units and his wife 200 workday units, the total family earnings for the year would be 4,725 rubles in cash, 2,970 pounds of wheat, 422 pounds of sunflower seed, 2,970 pounds of vegetables, and 2,230 pounds of fodder. Some of the wheat and perhaps all the sunflower seed probably would be converted into cash.

ILLUSTRATION 2--VICTORY COLLECTIVE FARM NEAR AKMOLINSK

The Victory collective farm is located in the new-lands area of northern Kazakh S.S.R., although a considerable part of the land on this farm was under plow prior to the initiation of the large-scale new-land development scheme in 1952. However, more than one-third of the cropland was reclaimed and brought into production since 1953.

The growing season at Akmolinsk averages 129 days, and the average annual precipitation is 14.3 inches.

The collective consists of three villages that were formerly separate collectives. Two collectives merged in 1952 and a third joined in 1957.

People.--The 393 households on the farm, with a total population of 1,398, include as able-bodied workers (and members of the collective), 300 men from 16 to 60 years of age, and 373 women from 16 to 55 years of age. The people live in three villages, which are some distance apart, as the farm extends for 27 miles in one direction and 18 in the other. Because of the great distance, the farm has summer living quarters at five field stations where workers stay for certain periods during the crop season. As on other collective farms, the households are allotted small plots of land for house, garden, and the keeping of a few individually owned livestock.

Land Use.--The total land area of the farm is 41,167 hectares, or 102,000 acres. In addition, the collective has two "out-pasture" areas which are located 100 and 230 miles away from the collective farm, containing 49,000 acres of pasture land for grazing 2,500 sheep and 370 horses. The "home" farm contains 29,006 hectares (or 71,674 acres) of plowland, of which 22,558 hectares (or about 55,700 acres) were sown to crops in 1958, as shown in table 16.

About 9 percent of the wheat is seeded on summer fallow land. The farm chairman estimated a yield increase of 3 to 3.5

centners per hectare (4.5 to 5.2 bushels per acre) on wheat after fallow. As additional new land is brought in, the management plans to increase summer fallow acreage up to about 20 percent of wheat acreage.

New-land development on this farm began in 1954. Since then 10,322 hectares (25,500 acres) of virgin lands have been plowed. The difference in acreage of plowland and of acreage in crops, plus perhaps 4,000 acres now in summer fallow, would suggest that there remain some 10,000 to 12,000 acres of plowland that can be converted to cropland use. The cropland is handled in a 11-year rotation as follows:

First year.....	Summer fallow
Second year.....	Spring wheat
Third year.....	Spring wheat with perennial grasses
Fourth, fifth, and sixth years.....	Perennial grasses
Seventh year.....	Durum wheat
Eighth year.....	Spring wheat
Ninth year.....	Annual grass
Tenth year.....	Spring wheat
Eleventh year.....	Grain crops for for- age.

Crop Yields.--Yield data obtained for the 1957 crops are given in table 17.

Yields obtained in 1957 are probably representative of a fairly good year. The data given in table 18 were provided by the local director of agriculture for the Akmolinsk Region, which has almost 9 million acres of wheat.

Yields on this farm in 1957 were far above the average for the Akmolinsk Region, so the farm undoubtedly has better soils and more favorable rainfall than the general area.

Livestock.--This area is essentially suited to dryland grain production, but even here Soviet policy calls for expansion of meat and milk production. Livestock num-

TABLE 16.--Cropland use on Victory collective farm near Akmolinsk, Akmolinsk Region, U.S.S.R., 1958

Crop	Hectares	Acres
Spring wheat.....	16,652	41,100
Oats.....	1,773	4,380
Barley.....	891	2,200
Millet.....	818	2,040
Peas.....	60	148
Flax.....	457	1,125
Sunflower.....	200	495
Vegetables and melons.....	95	235
Potatoes.....	125	385
Fodder crops.....	1,697	4,190
(including fodder corn).....	(771)	(1,905)

TABLE 17.--Yields of important crops at Victory collective farm, near Akmolinsk, U.S.S.R., 1957

Crop	Yield	
	Centners per hectare	Bushels per acre
Spring wheat.....	14.6	21.7
Barley.....	15.4	28.5
Oats.....	11.6	32.3
Millet.....	16.8	31.2

TABLE 18.--Precipitation and average wheat yields for the Akmolinsk region, U.S.S.R., 1953-58

Year	Annual precipitation (northern zone)		Average wheat yields	
	Millimeters	Inches	Centners per hectare	Bushels per acre
1953.....	329	13.0	8.6	12.8
1954.....	342	13.5	10.0	14.9
1955.....	235	9.3	2.5	3.7
1956.....	367	14.4	10.0	14.9
1957.....	302	11.9	8.2	12.2
1958.....	--	--	¹ 13.0	¹ 19.3

¹ Expected.

bers on the farm in July are given in table 19.

As on other farms, a significant part of the livestock is individually owned and maintained on the peasant plots, particularly dairy cows, hogs, and poultry. The livestock enterprises are a minor part of the farming operations.

Farm Machinery.--As on most other collective farms, machinery was purchased from the machine-tractor station in the spring of 1958 (table 20).

The machinery purchased from the state-owned machine-tractor station will be paid for by the collective in 3 years. Fifty percent of the total sum had already been paid, presumably out of the collective farm indivisible fund. The balance will be paid in the next 2 years. The farm machinery is located primarily at five machine-tractor stations on the farm, each of which has permanent storage and repair facilities.

Labor Use.--The primary work force is organized into five "complex tractor field brigades." Each brigade has responsibility for handling all farming operations on an allotment of cropland, which averages more than 4,000 hectares (about 10,000 acres) for each brigade. Each brigade has a brigade leader, an assistant brigade leader, and a bookkeeper. The center of operations for each brigade is the machine station, which has permanent buildings for machine storage and repair, and houses for the four or five families who live permanently at each field station. In addition, there is a dormitory for workers who stay at the stations at certain periods during the crop season, but who have their homes in the three villages.

The central headquarters for the farm is located in the largest of the three villages. The administrative staff, in addition to the farm chairman, includes two animal hus-

TABLE 19.--Livestock in communal herds and owned individually by households, Victory collective farm, near Akmolinsk, U.S.S.R., 1958

Livestock	In communal herds	Individually owned
Cattle, all.....	3,289	920
Milk cows.....	832	620
Hogs.....	707	700
Sheep, all.....	5,984	450
Ewes.....	3,047	(¹)
Goats.....	--	150
Horses.....	513	--
Poultry.....	6,606	(¹)

¹ Not reported.

TABLE 20.--Machinery--number and purchase price--on Victory collective farm, near Akmolinsk, U.S.S.R., 1958

Item	Number	Purchase price (1,000 rubles)	
		Total	Average per unit
Tractors ¹	52	895	17.2
Combines.....	40	878	21.9
Windrow reapers.....	30	135	4.5
Hay balers.....	30	27	.9
Miscellaneous.....	--	852	--
Total.....	--	2,787	--

¹ 43 of these are 54 hp. crawler tractors and 9 are general-purpose row-crop tractors.

bandry specialists, two veterinarians, two agronomists, two mechanics, and seven accountants or bookkeepers.

Also located at headquarters are four men for handling general supplies and storage, four caretakers (presumably guards), and six weigh men.

Most of the livestock operations, including dairy and hog barns for communal herds, are located near the central headquarters. The four animal husbandry specialists and veterinarians serve as managers of the livestock farming operations, including management of the sheep and horse raising operations on the far distant "out pastures." Twelve workers live permanently at these pasture areas, supplemented by 13 more in the summer months.

Farm Income.--Gross cash income in 1957 was about 10 million rubles, but it was estimated that it would be considerably larger in 1958 because of the addition of the third village and accompanying lands after the 1957 crop season. The collective farm paid an income tax of 991,000 rubles in 1957 at the 13-percent rate on net income. The net income thus was about 7.6 million rubles, making the total cash costs of operating the farm about 2.5 million rubles.

The annual farm plan is prepared in March of each year. From the planned crop acreages and estimated yields, a budget of expected income is prepared. The plan for 1958 showed 13.99 million rubles expected from sales of grain, 0.6 million from flaxseed and sunflowers, and 0.6

from truck crops, for a total expected income from crops of 15.2 million rubles. Perhaps 1.5 million rubles additional might be expected from sale of livestock and livestock products.

Plans for disposal of the 1958 expected grain production of 323,000 centners were given as follows:

	Centners
For delivery to the state.....	233,000
For seed stock.....	30,137
For livestock feed (communal herds)	28,885
For distribution to members	26,503

The planned distribution of grains to members would mean an average of 8,800 pounds per member or about 15,000 pounds per household. Perhaps 2,000 to 2,500 pounds might be used for bread and cereal consumption by the farm family and 1 or 2 tons for livestock feed, but there would still remain a large amount for disposal, either by selling back to the collective or by selling to the state. This problem of disposal of commodity dividends by the peasant families was recognized, on questioning at several places. At another farm the chairman stated that the workers "have the desire to get as much cash as possible," so they "do not exclude the possibility of doing away with grain distribution to members."

Schools.--The young people of the three villages attend three schools located on the farm. One is a 10-year school, another is a seven-year school, and the third is a kindergarten.

ILLUSTRATION 3--FIFTH ANNIVERSARY OF UZBEKISTAN STATE FARM, NEAR TASHKENT

This state farm was established in 1930, 5 years after the Uzbek S.S.R. was established in 1925; hence, its name. At that time the land was entirely waste and marshland. The land has been reclaimed and an irrigation system has been developed since 1930.

Rainfall averages 13.5 inches per year at Tashkent, but apparently little of this falls during the growing season. The summer climate and the appearance of the area are similar to southern Arizona.

People.--About 2,500 households live in several villages on the farm, of which 1,600 are full-time hired farmworkers. The workers engaged in nonfarm employment include 100 teachers and 35 physicians; also shopkeepers, postal and telegraph

workers, and other nonfarm occupations. However, many women and children are hired for cotton picking on a piecework basis during harvesttime. Most families are of Uzbek origin, although some have a Russian background.

About 95 percent of the workers live in dwellings constructed by the state. Rentals paid by the workers are low--only 17 rubles per month for workers who earn about 1,000 rubles per month. Rentals are even less for lower paid workers.

The other 5 percent of the workers live in their own houses. According to the farm director, home building is encouraged, and state loans are granted to workers for construction of their own houses.

Workers are allotted 1/3 to 1/2 acre of land per family for their own use.

The 2,500 children of school age on the farm attend 21 schools. The 10-year school, equivalent to our high schools, has 800 students. There are seven 7-year schools, 6 primary schools, and 7 kindergartens. Attendance is compulsory through the 7-year school, but it was reported that 90 to 95 percent of the children go beyond the seventh year. Instruction is mainly in the Uzbek language for the Uzbek children and in Russian for the Russian children, but each group is required to learn the language of the other group, beginning with the fifth school year.

Land Use and Crop Yields.--The farm contains 7,259 hectares (17,900 acres) of land, of which 5,320 hectares (13,146 acres) are irrigable and irrigated. Cropland use in 1958 is shown in table 21.

TABLE 21.--Use of cropland on Fifth Anniversary of Uzbekistan State farm, near Tashkent, U.S.S.R., 1958

Crop	Hectares	Acres
Cotton.....	3,700	9,120
Alfalfa.....	1,500	3,700
Grain cover crops.....	(550)	(1,360)
Corn.....	275	680

Only 20 percent of the corn acreage is harvested for grain (for seed stock); the balance is used for corn silage. The grain and forage produced is all used on this farm for livestock feed.

Cotton yields are now about 27 centners (5,940 pounds) of seed cotton per hectare, or 2,400 pounds per acre. At the local ratio of 2.86, this is 840 pounds of lint per acre. The average yield for the Uzbek Republic, which has 3.3 million acres of cotton, was reported as 664 pounds of lint per acre in 1957. Total production of seed cotton in 1957 on this farm was 9,500 metric tons. The delivery goal for 1958 was established at 9,300 tons, but the management expects the farm to produce 12,000 tons.

Expectations for production of alfalfa hay in 1958 were given as 5,500 metric tons, or an average of 1.64 short tons per acre, a very modest yield. Corn silage was expected to yield 10 short tons per acre.

The farm uses an 8-year crop rotation consisting of 5 years of cotton and 3 years of alfalfa.

Livestock.--Little emphasis was given to livestock production on this farm. Two adjacent barns housed 175 dairy cows; and an 820-hog enterprise included 50 sows. In addition, there are a number of other cattle, sheep, and horses.

Farm Machinery.--The primary equipment was 229 tractors (mostly 15 hp. general-purpose tractors) and 54 cotton-pickers. The cottonpickers were of the older vertical spindle type. There were 13 field cotton cleaners, one for each 4 or 5 pickers, to clean the cotton after it comes from the mechanized pickers. These field cleaners removed some of the leaves and trash and presumably resulted in somewhat higher grades and prices to the farm, which received payment for cotton as it left the farm for the gin in a nearby town. But it appeared to be an expensive process in terms of both machinery and the labor required for the extra handling. The cotton is dumped on the ground from the pickers, then loaded by hand into the field cleaner. After leaving the cleaner, it is either hauled directly to the gin or to a dryer located on the farm.

Labor Organization.--Under the general supervision of the farm director, the farm is organized into seven sections. A manager, with an agronomist and a mechanic as principal assistants, is responsible for all farming operations on 700 to 1,000 hectares (about 1,700 to 2,500 acres) of cropland allotted to his section. Each section is responsible for from 1,000 to 1,700 acres of cotton.

The work force in each section is subdivided into field brigades, organized primarily around the cotton enterprise. Each field brigade has a brigadier who is in charge of 25 to 30 workers. These workers handle an average of 115 hectares (285 acres) of cotton. There are 32 such field brigades on the farm to handle the 3,700 hectares of cotton, which gives an average of 2.3 hectares of cotton per full-time worker on the farm. The field brigade handles all operations other than the tractor work. They do the chopping, topping, irrigating, weeding, and harvesting of cotton.

The tractor and machine operations, such as plowing, seeding, and cultivating, are handled by tractor field brigades, of which there are 22 on the farm. Each tractor field brigade is assigned an area of cotton that can be handled by 4 tractors--about 150 to 160 hectares (370 to 390 acres). One

tractor driver handles about 40 hectares and is assigned helpers as needed from the regular field brigades, usually 6 or 7 people.

The director stated that the labor organization was in process of transition toward orientation around the 22-tractor field brigades. Presumably, these would be what is called a "complex tractor field brigade," organized to handle all farming operations in one labor unit.

The 1,600 permanent workers on the farm were characterized as about 1,200 workers "of lower grade," and 400 "expert workers" such as tractor drivers and administrative personnel.

Wages.--This state farm may be considered a "factory in the field." All workers are paid regular salaries as in industry. They are direct employees of the state and they share in the state pension and welfare systems as do industrial workers, including paid vacations. Wage scales paid on this farm were given as follows:

	Rubles per month
Brigadier (who is also a mechanic)	- 1,200
Tractor driver	- 1,000
Irrigators	- 750
General helpers and workers	- 600

In addition, workers receive bonuses for extra performance. An example was given of savings on production costs. The brigade may have a budget of 120,000 rubles to cover production costs on 37 hectares of cotton. If the manager can meet the yield goal with an expenditure of only 100,000 rubles, the workers of the brigade may share 60 percent of the savings of 20,000 rubles, or 12,000 rubles.

An example also was given of sharing in obtaining excess production. The plan may require a production of 80 tons of cotton from land operated by a brigade. Production cost per ton is estimated as 1,850 rubles per hectare for this farm, or 148,000 rubles for 80 tons. Actual production amounted to 100 tons, and total expenditures were 152,000 rubles. But 100 tons at 1,850 rubles would be an estimated cost of 185,000 rubles, so there was a calculated saving of 33,000 rubles. The 60 percent of this saving, or 19,800 rubles, may be distributed to workers of the brigade.

The average wages paid to state farm workers in the Uzbek S.S.R. was reported as 730 to 800 rubles per month or about 9,600 rubles per year. Such earnings probably would exceed earnings of collective farmworkers by one-third to one-half.

About 15 percent of the labor on this farm was handled by part-time workers, usually women and older children. They were employed almost entirely for cotton picking. In cotton picking, minimum quotas of 40 to 60 kg. per day are established, the quota varying with different pickings. A base payment of 16.2 rubles is paid for fulfillment of a daily quota which at the height of the season is 50 kg. (110 pounds of seed cotton). For each kilogram picked over the quota, an extra 0.5 rubles is paid. The average amount of cotton picked per day was given as 60 to 80 kg. Thus, a worker who picked 70 kg. (154 pounds) would receive 26.2 rubles (\$2.62 at the 10 to 1 exchange rate).

Cotton Practices.--Cotton is irrigated 4 times a year, with a total annual water application per hectare of 4,000 to 5,000 cubic meters (1-1/3 to 1-1/2 acre-feet per acre).

Cross block cultivation is practiced, with six cultivations lengthwise of the field and four cultivations crosswise of the field. Weed control with this system is not considered to be a serious problem, but it is necessary to hand pull grass twice each year. Labor requirements for this are 6 hours per hectare.

Fertilizer application is made at the rate of 50 kg. of nitrogen and 50 kg. of phosphate for each ton of seed cotton expected to be produced per hectare.

Cotton insect control measures are used for web worms and aphids. Tractor spraying is done at the edges of the field, and airplane dusting is used when infestations are serious. It was reported that one plane sprays 320 hectares per day and does the job more cheaply than with tractor dusting (1,200,000 acres of cotton were dusted by plane in Uzbek S.S.R. in 1958).

Cotton plants are topped or pinched to control height of growth. This requires an average of 3 man-days of labor per hectare.

Defoliation is practiced annually before harvest. Chemicals are applied when an average of two bolls per stalk are open.

Where mechanical pickers are used they go over the fields for the first two pickings. The third picking is by hand.

STATISTICAL DATA

TABLE 22.--Miscellaneous price data obtained at various locations

Prices received by collective and state farms

Item	Unit	Price in rubles ¹	Area of production	Year	Source of information
Wheat.....	(100 kilograms	60 to 61	Kuban' region	² 1958	Collective farm
	(do.	68	Ukraine region	² 1958	Ministry of Agriculture
	(do.	54	do.	1957	Do.
	(do.	66 to 68	Crimean region	² 1958	Do.
	(do.	60	Akmolinsk	² 1958	Collective farm
Cotton:	Metric tons of				
First-grade.....	seed cotton	3,600	Uzbek S.S.R.	1957	Ministry of Agriculture
Second-grade.....	do.	3,100	do.	1957	Do.
Third-grade.....	do.	2,700	do.	1957	Do.
Fourth-grade.....	do.	1,860	do.	1957	Do.
Egyptian-type....	do.	6,700 to 7,300	do.	1957	Do.
Potatoes:					
Average.....	Kilogram	0.56	Leningrad	1957	Collective farm
Early.....	do.	3.0	do.	1957	Do.
Milk.....	(Liter	1.0	Kuban' region	1957	State farm
	(do.	1.37	Ukraine region	1957	Collective farm
	(do.	³ 1.1	do.	1957	State farm
	(do.	³ 1.8	do.	1957	State farm
	(do.	⁴ 1.8	Leningrad	1957	Collective farm
	(do.	⁵ 1.5	do.	1957	State farm
	(do.	1.26	do.	1957	State farm
Hogs (live weight)	(100 kilograms	800	Kuban' region	1957	Collective farm
	(do.	641	do.	1957	State farm
Eggs:					
Best quality.....	10 eggs	8	Southern Caucasus region	1957	Do.
Ordinary quality.	do.	5	do.	1957	Do.
Apr. 1 - Oct. 1	do.	5.1 to 8.6	Leningrad	1957	Do.
Oct. 1 - Mar. 31	do.	6.0 to 9.4	do.	1957	Do.
Chickens (dressed)	(Kilogram	11 to 17	Southern Caucasus region	1957	Do.
	(do.	10 to 15	Leningrad	1957	Do.

TABLE 22.--Miscellaneous price data obtained at various locations--Continued

Prices paid for farm production goods

Item	Unit	Price in rubles	Location where data were obtained	Source of data
Tractors:				
54 hp. diesel crawler (1958).	Each	21,700	Factory ⁶	Moscow Agricultural Exhibit
Do. (1958).	do.	16,200	Ukraine region	Machine repair and service station
Do. (1957).	do.	21,000	do.	Do.
Mostly 54 hp. ⁷	do.	17,200	Akmolinsk	Collective farm
40 hp. general-purpose diesel, hydraulic lifts.....	do.	22,000	Ukraine	Machine station
Do.	do.	23,700	Factory ⁶	Moscow Agricultural Exhibit
80 hp. diesel crawler.....	do.	32,000	do. ⁶	Do.
14 hp. general-purpose.....	do.	11,000	do. ⁶	Do.
Combines:				
Self-propelled, 4.0-meter cut	do.	23,900	do. ⁶	Do.
Do.	do.	23,000	Ukraine	Machine station
Pull-type, 4.0-meter cut.....	do.	17,000	Factory ⁶	Moscow Agricultural Exhibit
Do. ⁸	do.	21,900	Akmolinsk	Collective farm
Grain reapers:				
Tractor-pulled, 4-meter cut..	do.	3,750	Factory ⁶	Moscow Agricultural Exhibit
Do. ⁹	do.	4,500	Akmolinsk	Collective farm
Diesel fuel.....	Liter	.32	Ukraine region	Machine station
Benzine or petrol.....	do.	.52	do.	Do.
Do.	do.	.47	Krasnodar	Chauffeur
Fertilizer:				
Potash (75 percent).....	Metric ton	120	Uzbek S.S.R.	Collective farm
Ammonium sulfate (34 per- cent).....	do.	920	do.	Do.
Superphosphate (16 percent)..	do.	190	do.	Do.
Potash.....	do.	200	Kuban ¹	State farm
Nitrogen.....	do.	250	do.	Do.
Phosphate.....	do.	150	do.	Do.

TABLE 22.--Miscellaneous price data obtained at various locations--Continued

Prices paid for consumer goods

Item	Price in rubles	Approximate price in United States ¹⁰ (dollars)	Location and source
Men's suit:			
Ordinary.....	850	35	Moscow department stores
Good.....	1,865	60	Do.
Men's shoes, pr.....	250	10 to 12	Do.
Men's hats.....	150	5 to 6	Do.
Men's dress shirts.....	72	3 to 4	Do.
Men's melton overcoats	2,200	60 to 70	Do.
Women's cloth coat			
with fur collar.....	3,280	100 to 125	Do.
Bicycle.....	600 to 700	35 to 40	Kiev, Govt. official
Small car (Volga).....	40,000	2,500	Moscow, Govt. official

Retail food prices, Moscow, July 1958

Item	Price per lb. in rubles	Item	Price per lb. in rubles
Cheese.....	11.0 to 17.5	Other sausage.....	12.0
Butter.....	12.0 to 13.0	Chicken.....	12.0
Meat (several kinds).....	11.0 to 12.0	Tomatoes (early).....	5.5 to 6.0
Bacon.....	10.0	Strawberries.....	5.5 to 6.0
Fat Back.....	11.0	Apricots.....	5.5 to 6.0
Ham.....	13.0	Tomatoes (late).....	3.5
Bologna sausage.....	8.0		

¹ Tourist exchange rate is 10 rubles per dollar.² Estimated.³ Same farm. Lower price for delivery to state, higher price for delivery to stores in Kiev.⁴ Winter price.⁵ Summer price.⁶ Price given was that at the factory; shipping and other charges would be extra.⁷ 52 used and new tractors purchased from nearby MTS.⁸ 40 used and new combines purchased from nearby MTS.⁹ 30 used and new reapers purchased from nearby MTS.¹⁰ Rough judgment on price in U. S. stores for comparable quality.

TABLE 23.--Area sown to crops in selected years, Soviet Union¹

Crop	1940 ²	1945 ²	1950	1951	1952	1953	1954	1955	1956	1957	1958 ³
	Million acres	Million acres	Million acres	Million acres	Million acres	Million acres	Million acres	Million acres	Million acres	Million acres	Million acres
Wheat:											
Winter.....	35.34	22.24	30.89	38.55	42.50	43.98	38.79	45.22	31.88	--	--
Spring.....	64.25	39.29	64.25	67.71	71.91	75.37	83.03	104.28	121.33	--	--
Total.....	99.59	61.53	95.14	106.26	114.41	119.35	121.82	149.50	153.21	170.75	165.06
Rye, winter.....	57.08	50.16	58.32	59.06	56.34	50.16	50.66	47.20	45.47	44.73	43.74
Corn grown ⁴ for grain.....	8.9	10.38	11.86	10.13	9.64	8.65	10.63	22.49	22.98	14.33	20.02
Other ⁵	--	--	--	--	--	--	--	21.74	36.08	30.89	28.66
Total.....	8.9	10.38	11.86	10.13	9.64	8.65	10.63	44.23	59.06	45.22	48.68
Barley.....	27.92	25.70	21.25	20.02	21.25	23.72	26.44	24.46	29.40	22.73	23.72
Oats.....	49.91	35.58	40.03	43.0	41.02	37.81	39.29	36.57	37.31	34.59	36.32
Rice.....	.49	.49	.25	.25	.25	.25	.25	.25	.25	--	--
Buckwheat.....	4.94	4.45	7.41	6.67	6.18	6.42	6.92	6.92	6.67	--	--
Millet.....	14.83	14.58	9.39	8.15	8.65	10.13	13.59	19.03	15.81	--	--
Grain legumes.....	5.93	3.71	4.94	4.20	3.95	3.95	4.45	3.46	3.21	--	--
Other grain.....	3.46	4.20	5.68	5.19	3.56	3.21	2.97	2.47	2.72	--	--
Total grain.....	273.05	210.78	254.27	262.93	265.25	263.65	277.02	312.35	317.03	307.89	309.37
Potatoes.....	19.03	20.51	21.25	20.76	20.26	20.51	21.50	22.49	22.73	24.22	23.47
Vegetables.....	5.68	5.68	4.69	4.69	4.69	4.94	5.68	5.68	5.93	3.71	3.71
Sugar beets.....	3.04	2.05	3.24	3.43	3.61	3.88	3.95	4.35	4.97	5.21	6.23
Sunflowers.....	8.75	7.24	8.87	8.92	9.07	9.64	9.96	10.48	11.14	8.55	9.74
Cotton.....	5.14	2.99	5.73	6.72	6.99	4.65	5.44	5.44	5.11	5.16	5.29
Flax for fiber.....	5.19	2.47	4.69	3.95	3.78	3.06	2.74	3.66	4.74	4.18	3.95
Flax for seed.....	.86	.47	.89	.82	.94	1.14	1.09	1.04	1.16	--	--
Hemp.....	1.48	.69	1.38	1.41	1.33	1.26	1.43	1.46	1.53	1.14	.99
Tobacco.....	.25	.20	.25	.25	.27	.27	.30	.27	.27	--	--
Makhorka.....	.27	.27	.27	.27	.27	.27	.25	.22	.20	--	--
Forage crops ⁷	44.73	25.20	51.15	58.56	63.33	70.92	77.10	66.47	66.96	112.18	114.00
Other crops.....	4.18	2.64	4.82	5.36	5.09	4.25	4.00	3.48	3.24	--	--
Total crops.....	371.65	281.19	361.50	378.07	384.88	388.44	410.46	459.13	481.09	478.63	483.08

¹ Data from official sources. Exclusive of winterkilled grain not resown in the spring. ² Figures for territory within the boundaries existing in that year. ³ Preliminary. ⁴ Includes some immature corn grown for silage and converted to dry grain equivalent. ⁵ Included with grain until 1955. ⁶ Excludes corn not grown for grain. ⁷ Includes some corn grown for silage and green fodder.

TABLE 24.--Distribution of area sown to crops by kind of farms, Soviet Union, in selected years¹

Kind of farms	1928	1940	1950	1955	1956
	<i>Million acres</i>	<i>Million acres</i>	<i>Million acres</i>	<i>Million acres</i>	<i>Million acres</i>
Collective farms (kolkhozy).....	3.39	290.89	299.02	343.27	368.33
State farms and other state enter- prises.....	4.27	32.77	39.34	49.37	72.57
Private holdings of the kolkhozniki ² ...	2.84	11.12	14.58	14.06	14.31
Workers and salaried personnel.....	--	2.03	3.85	3.63	3.93
Individual peasant farmers.....	268.70	34.87	4.72	.99	.99
Total.....	279.20	371.68	361.51	411.32	460.13

¹ Data from official sources.

² Members of collective farms.

TABLE 25.--Distribution of area sown to crops by kind of farms, as percentage of total, Soviet Union, in selected years¹

Kind of farms	1928	1940	1950	1955	1956
	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Collective farms (kolkhozy).....	1.2	78.3	82.7	80.2	78.1
State farms and other state enterprises.....	1.5	8.8	10.9	15.8	18.1
Private holdings of kolkhozniki ²	1.0	3.0	4.0	3.1	2.9
Workers and salaried personnel.....	--	.5	1.1	.9	.84
Individual peasant farmers.....	96.3	9.4	1.3	.02	.02
Total.....	100.0	100.0	100.0	100.0	100.0

¹ Data from official sources.

² Members of collective farms.

TABLE 26.--Corn area by regions, Soviet Union, in selected years¹

Region	1953	1956	1956	1956
	Corn	Grain	Silage and green fodder	Total
	1,000 acres	1,000 acres	1,000 acres	1,000 acres
Northern.....	--	--	66.7	66.7
Northwestern.....	--	--	239.7	239.7
Russian S.S.R.....	.2	7.4	845.1	852.5
Lithuania.....	--	--	385.5	385.5
Latvia.....	--	--	163.1	163.1
Estonia.....	--	--	44.5	44.5
Central nonblack soil.....	--	24.7	3,261.7	3,286.4
Central black soil.....	205.1	1,504.8	3,358.1	4,862.9
Volga.....	17.3	1,008.2	3,568.1	4,576.3
Ukrainian S.S.R.....	4,351.4	12,246.3	6,024.3	18,270.6
Moldavian S.S.R.....	1,074.9	1,410.9	286.6	1,697.6
Northern Caucasus.....	1,779.1	4,791.3	1,865.6	6,656.9
Georgia S.S.R.....	862.4	766.0	165.6	931.6
Azerbaijan S.S.R.....	24.7	101.3	155.7	257.0
Armenian S.S.R.....	2.5	19.8	24.7	44.5
Eastern Siberia.....	.7	--	1,257.7	1,257.7
Ural.....	7.4	237.2	3,948.7	4,185.9
Western Siberia.....	4.9	19.8	5,522.7	5,542.5
Kazakhstan.....	98.8	318.6	4,250.1	4,568.9
Far Eastern.....	24.7	54.4	259.5	313.8
Kirgiz S.S.R.....	84.0	224.9	118.6	343.5
Uzbek S.S.R.....	66.7	173.0	247.1	420.1
Tadzhik S.S.R.....	7.4	39.5	56.8	96.4
Turkmen S.S.R.....	.5	19.8	46.9	66.7
Total, Soviet Union.....	8,612.7	22,967.9	36,163.1	59,131.3

¹ Data from official sources.

TABLE 27.--New land brought into cultivation in the eastern regions of the Soviet Union during 1954-56¹

Region	Collective farms	State farms	Total
	1,000 acres	1,000 acres	1,000 acres
Kazakhstan.....	25,382	23,729	49,111
Ural.....	3,684	6,944	6,944
Western Siberia.....	12,409	2,570	14,980
Eastern Siberia.....	3,170	1,080	4,250
Far Eastern.....	791	195	986
Volga.....	1,446	2,355	3,800
Northern Caucasus.....	1,006	1,473	2,478
	47,888	34,661	82,549
Other regions.....	5,483	677	6,160
Total Soviet Union.....	53,371	35,338	88,709

¹ Data from official sources.

TABLE 28.--Wheat area by regions, Soviet Union, in selected years¹

Region	1940	1950	1953	1956
	1,000 acres	1,000 acres	1,000 acres	1,000 acres
Northern.....	311.3	264.4	331.1	160.6
Northwestern.....	318.8	252.0	516.4	313.8
White Russian S.S.R.....	647.4	590.6	1,102.1	761.1
Lithuania.....	501.6	457.1	790.7	387.9
Latvia.....	390.4	331.1	556.0	328.6
Estonia.....	173.0	150.7	284.2	173.0
Central nonblack soil.....	3,377.9	2,345.0	4,514.5	3,671.9
Central black soil.....	7,064.6	6,451.8	9,073.5	6,913.9
Volga.....	11,082.4	10,064.4	12,105.4	14,240.4
Ukrainian S.S.R.....	17,739.3	16,187.5	23,583.2	10,192.9
Moldavian S.S.R.....	1,257.7	1,287.4	1,512.3	1,121.8
Northern Caucasus.....	11,658.2	12,631.8	13,610.3	13,368.1
Georgia S.S.R.....	672.1	654.8	1,119.4	657.3
Azerbaijan S.S.R.....	1,163.8	1,107.0	1,213.3	1,292.3
Armenian S.S.R.....	563.4	489.3	677.1	506.6
Eastern Siberia.....	3,857.2	3,600.2	4,173.5	6,315.9
Ural.....	9,651.7	9,664.1	11,537.1	16,113.4
Western Siberia.....	14,704.9	13,681.9	16,765.7	26,224.7
Kazakhstan.....	8,517.5	9,943.3	11,460.5	45,263.8
Far eastern.....	914.3	741.3	1,003.2	1,470.2
Kirgiz S.S.R.....	1,112.0	1,094.7	1,035.3	1,146.5
Uzbek S.S.R.....	2,500.7	1,934.8	1,598.7	1,734.6
Tadzhik S.S.R.....	1,013.1	1,069.9	822.8	768.5
Turkmen S.S.R.....	296.5	207.6	101.3	98.8
Total Soviet Union.....	99,489.8	95,202.7	119,487.6	153,226.6

¹ Data from official sources.

TABLE 29.--Cotton area by regions, Soviet Union, selected years¹

Regions	1940	1950	1955	1956
<u>Irrigated regions:</u>	1,000 acres	1,000 acres	1,000 acres	1,000 acres
Uzbekistan.....	2,282.0	2,713.4	3,256.5	3,222.9
Turkmenia.....	371.6	378.1	448.7	472.5
Tadzhikistan.....	262.2	311.3	399.8	407.5
Kazakhstan.....	251.5	239.4	282.7	271.6
Kirgizia.....	158.4	161.1	197.4	179.1
Azerbaijan.....	464.8	373.9	495.0	497.7
Armenia.....	39.5	42.0	45.7	39.5
Total irrigated area.....	3,830.0	² 4,219.2	5,125.8	5,090.8
<u>Nonirrigated regions:</u>	1,300.2	1,498.7	306.7	12.8
Total Soviet Union.....	5,130.2	² 5,717.9	5,432.5	5,103.6

¹ Data from official sources.

² According to the Soviet source from which this table was compiled, the irrigated area was equivalent to 4,225,400 acres, and the total area was equivalent to 5,724,100 acres.

TABLE 30.--Total livestock numbers, Soviet Union¹

Year	Cows	Cattle (including cows)	Hogs	Sheep	Goats	Sheep and goats	Horses
	<i>Million head</i>	<i>Million head</i>	<i>Million head</i>	<i>Million head</i>	<i>Million head</i>	<i>Million head</i>	<i>Million head</i>
January 1							
1916 ²	28.8	58.4	23.0	--	--	96.3	38.2
1916 ³	24.9	51.7	17.3	--	--	88.7	34.2
1928 ²	33.2	66.8	27.7	--	--	114.6	36.1
1928 ³	29.2	60.1	22.0	--	--	107.0	32.1
1929.....	29.2	58.2	19.4	--	--	107.1	32.6
1930.....	28.5	50.6	14.2	--	--	93.3	31.0
1931.....	24.5	42.5	11.7	--	--	68.1	27.0
1932.....	22.3	38.3	10.9	--	--	47.6	21.7
1933.....	19.4	33.5	9.9	--	--	37.3	17.3
1934.....	19.0	33.5	11.5	--	--	36.5	15.4
1935.....	19.0	38.9	17.1	36.4	4.4	40.8	14.9
1936.....	20.0	46.0	25.9	43.8	6.1	49.9	15.5
1937.....	20.9	47.5	20.0	46.6	7.2	53.8	15.9
1938.....	22.7	50.9	25.7	57.3	9.3	66.6	16.2
1939.....	24.0	53.5	25.2	--	--	80.9	17.2
1940.....	22.8	47.8	22.5	66.6	10.1	76.7	17.7
1941.....	27.8	54.5	27.5	79.9	11.7	91.6	21.0
1945.....	21.6	44.2	8.8	57.9	12.3	70.2	9.9
1946.....	22.9	47.6	10.6	58.5	11.5	70.0	10.7
1947.....	23.0	47.0	8.7	57.7	11.6	69.3	10.9
1948.....	23.8	50.1	9.7	63.3	13.5	76.8	11.0
1949.....	24.2	54.8	15.2	70.4	15.2	85.6	11.8
1950.....	24.6	58.1	22.2	77.6	16.0	93.6	12.7
1951.....	24.3	57.1	24.4	82.6	16.4	99.0	13.8
1952.....	24.9	58.8	27.1	90.5	17.1	107.6	14.7
1953.....	24.3	56.6	28.5	94.3	15.6	109.9	15.3
1954.....	25.2	55.8	33.3	99.8	--	--	--
1955.....	26.4	56.7	30.7	98.9	--	--	--
1956.....	27.7	58.8	34.0	103.3	--	--	--
1957.....	29.0	61.4	40.8	108.1	--	--	--
1958.....	31.4	66.7	44.3	120.1	--	--	--
1959.....	33.3	70.8	48.5	129.6	--	--	--

¹ The figures for each year are for the territory within the boundaries existing at that time, unless otherwise noted. Data from official sources.

² Present boundaries.

³ Boundaries prior to September 17, 1939.

TABLE 31.--Livestock by kinds of farms, Soviet Union, selected years¹

Item	October 1			
	1953	1954	1955	1956
Cows, million head.....	26.0	27.5	29.2	30.9
Distribution:	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Collective farms.....	35.2	37.3	36.8	37.1
State farms and other enterprises....	5.9	6.0	6.2	6.4
Privately owned by:				
Kolkhozniki ²	43.0	41.6	41.7	41.7
Workers and salaried personnel.....	15.7	14.8	15.1	14.6
Individual peasant farmers.....	.2	.3	.2	.2
All farms.....	100.0	100.0	100.0	100.0
All cattle, including cows, million head.....	63.0	64.9	67.1	70.4
Distribution:	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Collective farms.....	49.9	49.1	45.8	44.5
State farms and other enterprises....	7.9	7.8	8.2	8.5
Privately owned by:				
Kolkhozniki ²	31.7	32.3	34.4	35.6
Workers and salaried personnel.....	10.4	10.6	11.4	11.3
Individual peasant farmers.....	.1	.2	.2	.1
All farms.....	100.0	100.0	100.0	100.0
Hogs, million head.....	<i>Percent</i> 47.6	<i>Percent</i> 51.1	<i>Percent</i> 52.2	<i>Percent</i> 56.5
Distribution:	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Collective farms.....	45.1	44.1	44.5	46.0
State farms and other enterprises....	12.5	12.2	13.9	16.3
Privately owned by:				
Kolkhozniki ²	29.6	30.3	28.8	27.0
Workers and salaried personnel.....	12.7	12.9	12.6	10.6
Individual peasant farmers.....	.1	.2	.2	.1
All farms.....	100.0	100.0	100.0	100.0

See footnotes at end of table.

TABLE 31.--Livestock by kinds of farms, Soviet Union, selected years¹--Continued

Item	October 1			
	1953	1954	1955	1956
Sheep, million head.....	114.9	117.5	125.0	129.9
Distribution:	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Collective farms.....	72.5	69.1	66.0	64.7
State farms and other enterprises....	11.6	11.8	12.3	11.4
Privately owned by:				
Kolkhozniki ²	13.7	16.5	18.6	20.5
Workers and salaried personnel.....	2.2	2.5	3.0	3.3
Individual peasant farmers.....	³ .05	.1	.1	.1
All farms.....	100.0	100.0	100.0	100.0
Goats, million head.....	21.0	19.3	17.7	15.8
Distribution:	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>	<i>Percent</i>
Collective farms.....	24.2	18.1	14.8	12.5
State farms and other enterprises....	1.9	2.2	2.2	1.7
Privately owned by:				
Kolkhozniki ²	49.4	53.1	54.7	56.6
Workers and salaried personnel.....	24.2	26.0	27.9	28.7
Individual peasant farmers.....	.3	.6	.4	.5
All farms.....	100.0	100.0	100.0	100.0

¹ Data from official sources.² Members of collective farms.³ Less than one-tenth of a percent.TABLE 32.--Number of tractors, combines, and trucks on farms, Soviet Union, selected years¹

Beginning of year	Tractors		Combines	Trucks
	Number	Drawbar power		
	<i>Thousands</i>	<i>Million horsepower</i>	<i>Thousands</i>	<i>Thousands</i>
1939.....	484	9.3	153.8	196
1941.....	531	10.3	181.7	228
1951.....	595	14.0	211.2	283
1954.....	744	18.6	317.6	424
1955.....	795	20.1	337.9	465
1956.....	840	21.7	337.8	544
1957.....	892	23.7	385.1	631

¹ Data from official sources.

TABLE 33.--Commercial fertilizer production, Soviet Union, for specified years¹

Year	Nitrogen ²	Phosphate ³	Potash ⁴	Rock Phosphate ⁵	Total	Total plant nutrients ⁶
	1,000 metric tons	1,000 metric tons	1,000 metric tons	1,000 metric tons	1,000 metric tons	1,000 short tons
1928.....	11.2	111.5	--	12.7	135.4	28.2
1929.....	16.6	145.1	--	46.5	208.2	43.3
1930.....	19.4	302.9	--	181.3	503.6	104.7
1935.....	374.5	1,125.8	291.6	530.9	2,322.8	562.6
1936.....	552.8	1,256.6	406.6	623.0	2,839.0	702.4
1937.....	761.6	1,472.7	355.8	649.9	3,240.0	776.9
1938.....	828.1	1,595.7	357.9	631.5	3,413.2	814.7
1939.....	958.8	1,637.9	383.2	582.2	3,562.1	854.6
1940.....	971.7	1,351.9	532.3	381.7	3,237.6	824.9
1945.....	744.7	233.6	130.7	10.1	1,119.1	270.6
1946.....	894.1	560.9	203.5	50.6	1,709.1	424.1
1947.....	1,123.8	798.8	357.1	75.6	2,355.3	601.4
1948.....	1,353.0	1,411.1	465.7	238.0	3,467.8	863.7
1949.....	1,685.7	1,930.2	594.1	375.3	4,585.3	1,134.4
1950.....	1,908.3	2,350.5	750.4	483.2	5,492.4	1,366.3
1951.....	2,078.6	2,472.1	820.4	553.6	5,924.7	1,475.0
1952.....	2,236.0	2,654.8	904.7	598.8	6,394.3	1,599.0
1953.....	2,355.6	2,918.7	1,048.4	645.1	6,967.8	1,756.3
1954.....	2,648.6	3,350.3	1,294.6	766.4	8,059.9	2,050.6
1955.....	2,984.0	3,833.7	1,898.3	924.0	9,640.0	2,536.8
1956.....	--	--	--	--	10,900.0	--
1957.....	--	--	--	--	11,700.0	--
1958.....	--	--	--	--	12,400.0	--

¹ Data from official sources.

² Nitrogen is expressed in terms of ammonium sulfate.

³ Phosphate is expressed as 18.7 percent P_2O_5 .

⁴ Potash is expressed as 41.6 percent K_2O .

⁵ Rock phosphate is expressed as 19 percent P_2O_5 .

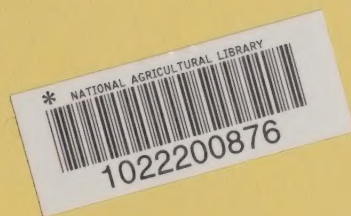
⁶ Converted on the basis of coefficients indicated in footnotes 2 to 5 and 20.75 percent of nitrogen in ammonium sulfate, based on an average of 20.5 to 21.0 percent, given in *Spravochnik Agronoma po Udebreniyam* [Agronomist's Reference Book on Fertilizers], p. 258, 2d ed., Moscow, 1955.

TABLE 34.--Average number of frost-free days per year and annual average precipitation in specified cities of the U.S.S.R.

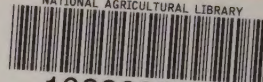
City	Average frost-free period	Average annual precipitation ¹	
		Millimeters	Inches
	<i>Days</i>		
Akmolinsk.....	129	363	14.3
Dnepropetrovsk.....	136 ²	450	17.7
Kiev.....	172	590	23.2
Krasnodar.....	190	649	25.6
Kuibyshev (Samara).....	164	342	13.5
Leningrad.....	160	522	20.6
Moscow.....	130	620	24.4
Novosibirsk.....	122	376	14.8
Rostov.....	184	470	18.5
Simferopol.....	176	437	17.2
Sochi.....	288	1,410	55.5
Tashkent.....	206	348	13.7

¹ One inch = 25.4 millimeters.

² Obtained at Sinel'nikovo, nearest point to Dnepropetrovsk, about 30 kilometers distant.



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